THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXII. No. 2474.] LONDON, OCTOBER 11, 1910. [62ND YEAR. PRICE 6d.

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"I cannot speak too highly of Cockey's Washers, they are simply invaluable. I gave full Information at the Meeting of an Association of Gas Managers, when President, at Southampton.

If you have plenty of room, I should have an Horizontal one, if short—why then a Vertical one.

The action of the Washer removes every trace of Ammonia."

December 23rd, 1908.

"You asked some time ago as to the working of Tar Extractor. I am pleased to report that it has been working for about six weeks, and is giving great satisfaction.

The whole of the Gas was passed through it for over a month, *without the aid of any other Washing Plant* (whilst the old Plant was being moved) and I was surprised at its being able to cope with the Gas so well, at this time of the year."

December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

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"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO_2 and H_2S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH_3, intending at a later date to erect a supplementary Scrubber. *At the present time the 'Cockey's' Washer is doing the whole of the work*, and we have not found any difficulty in removing the last trace of NH_3. We have passed equal to 300,000 cubic feet per diem.

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"Replying to your Letter of yesterday's date, I have very much pleasure in giving you my opinion of Messrs. E. Cockey and Sons' Vertical Washer, one of which I have here (to pass 500,000 cubic feet per day).

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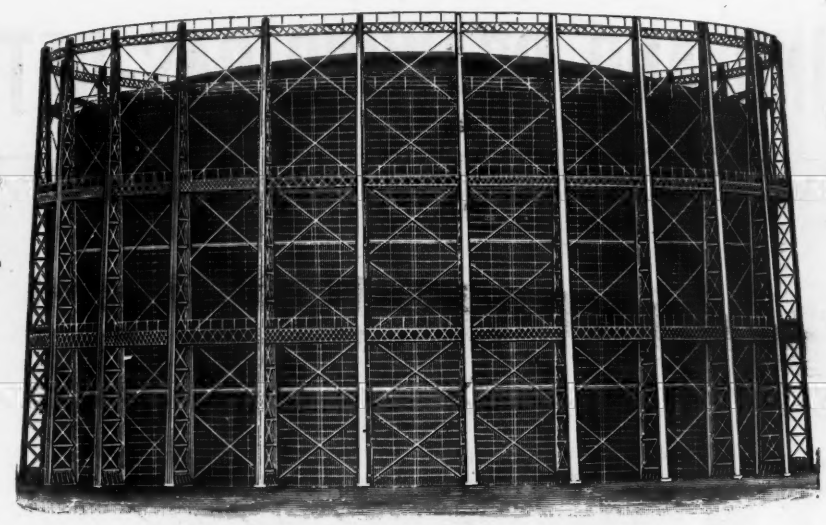

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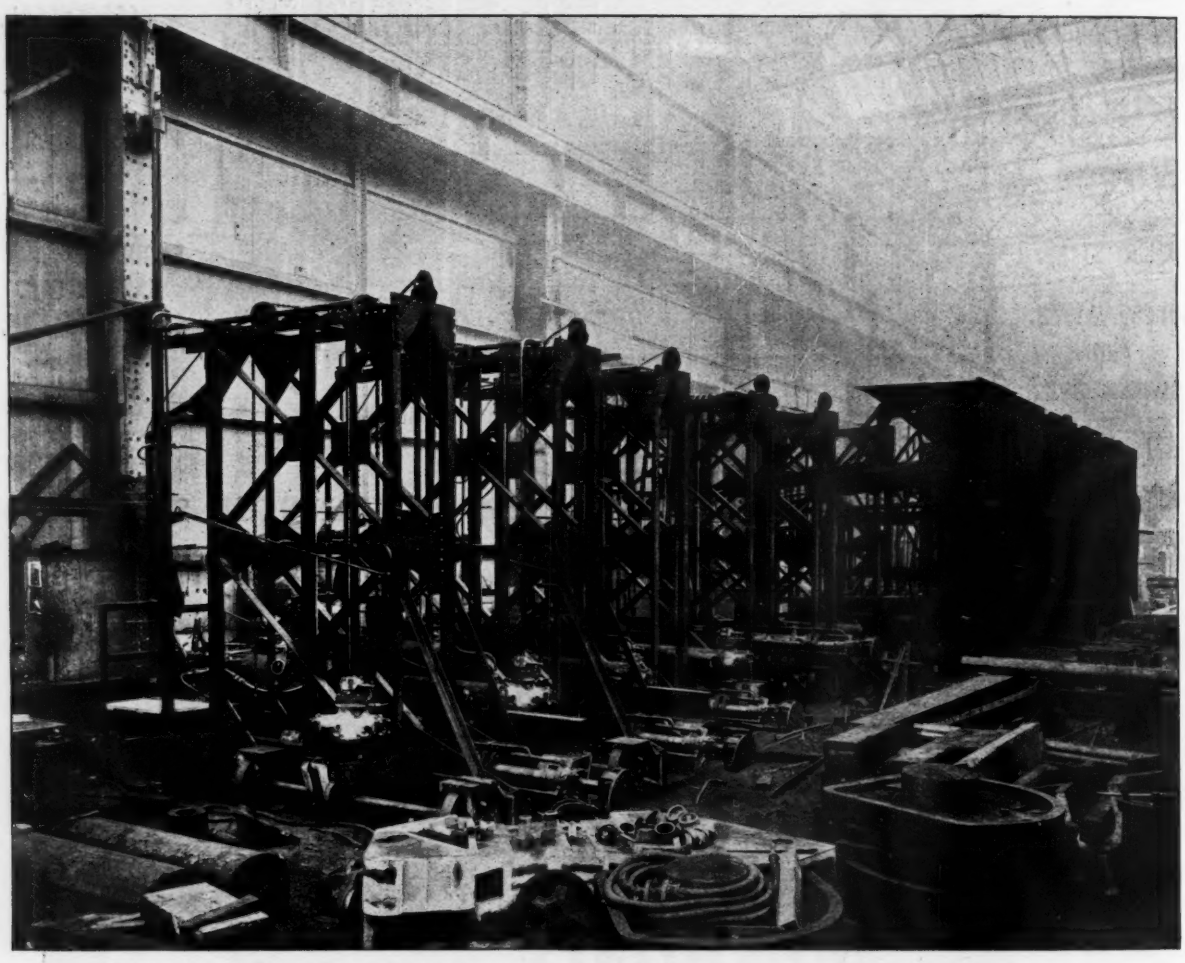

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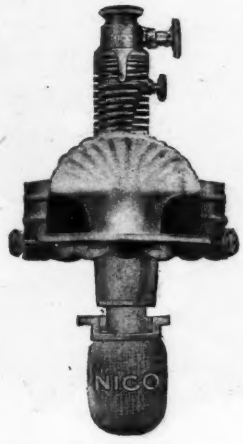

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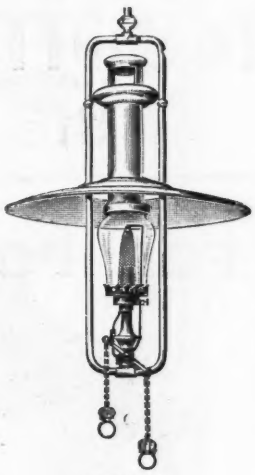

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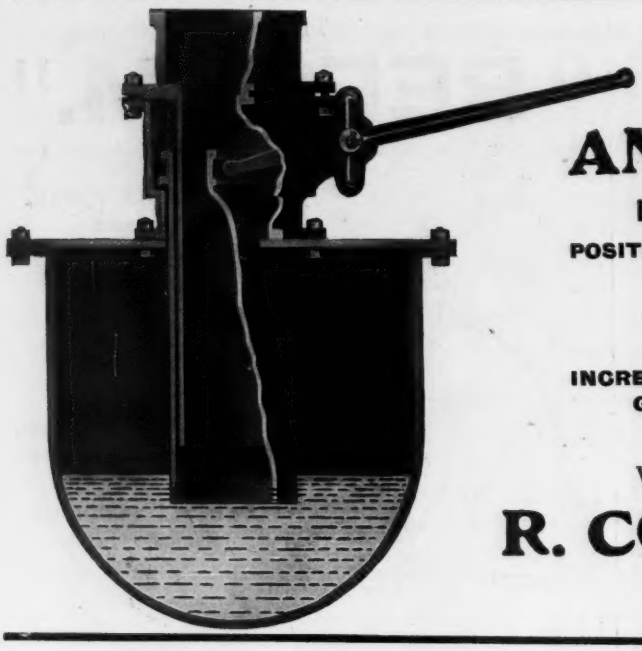

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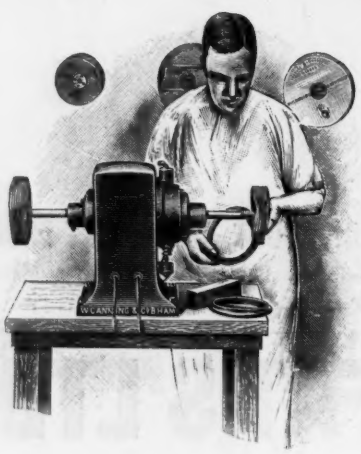

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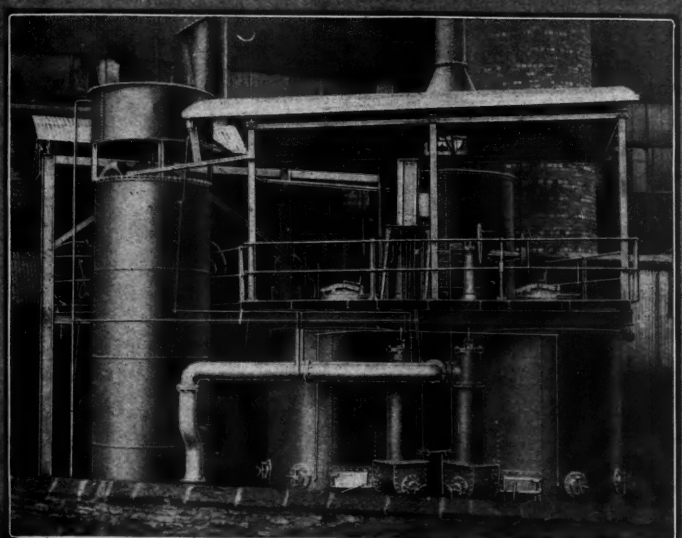

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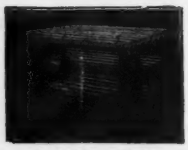

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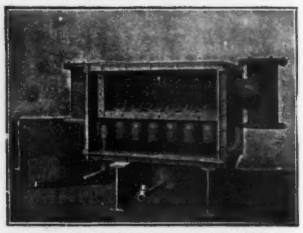

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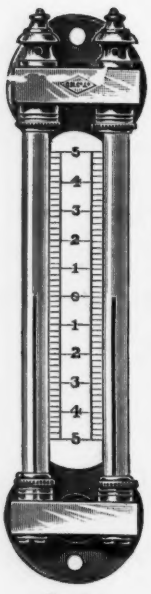

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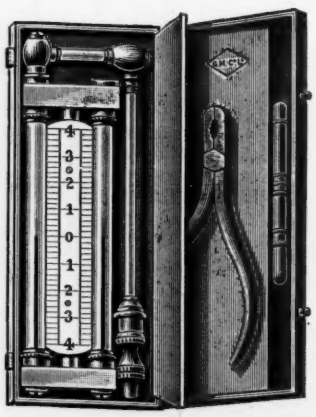

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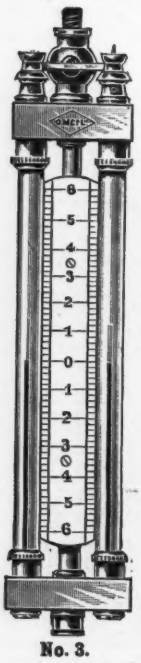

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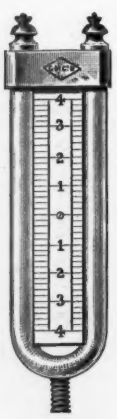

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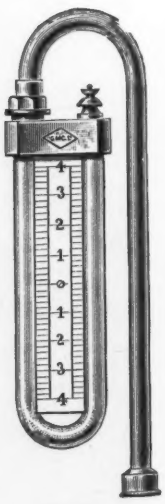

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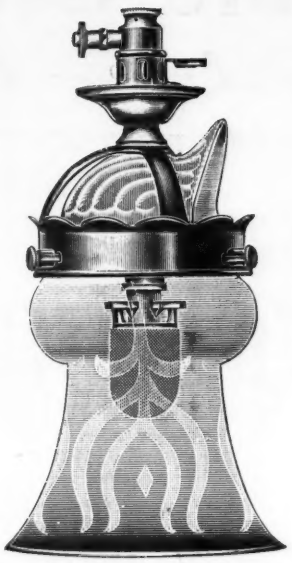

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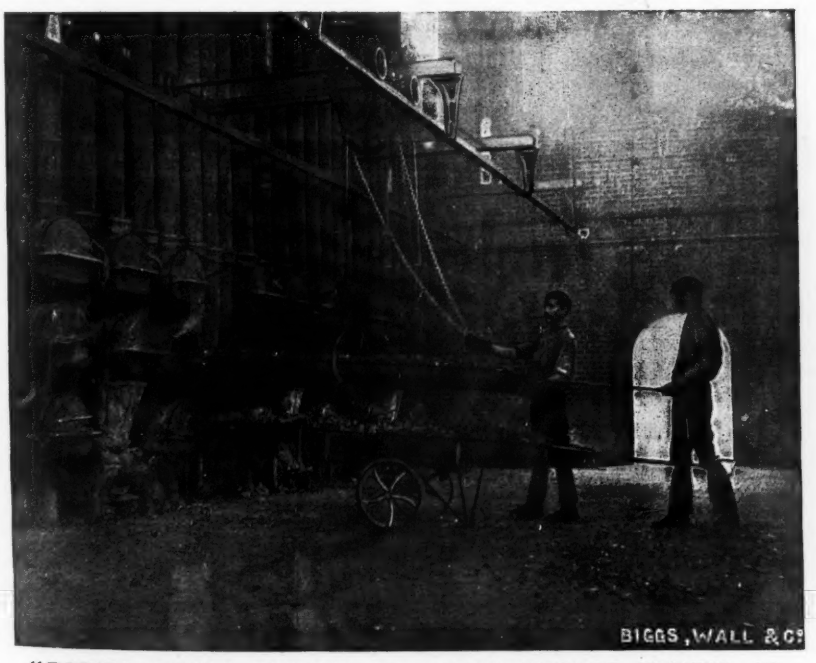

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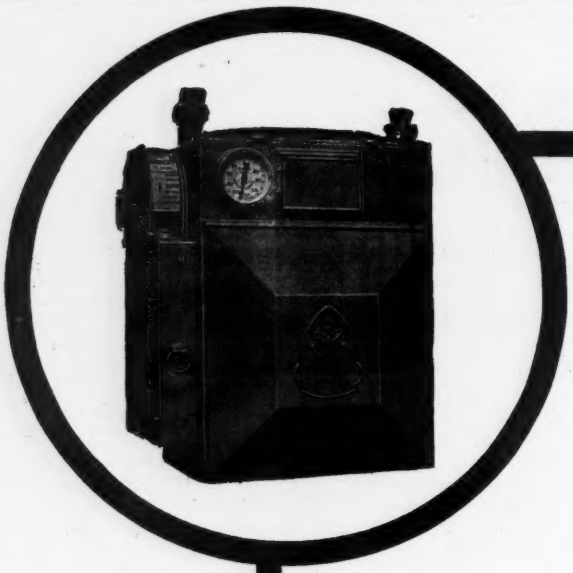

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EDITORIAL NOTES—GAS, &c.

German Friends.

THE past week has been a remarkable one in the annals of the gas professions of two nations, between which nations there are ties that cannot, or rather must not, be violated. The affinities between them are great. One has only to move and live for a short space with such men, representative of all that makes Germany great, as those members of the German Association of Gas and Water Engineers who were last week the guests of the gas profession and industry of this country to learn this, and also to realize that all our aspirations, all our feelings, occupy a common level, and that progress and the well-being of mankind at large are at the apex of the ambitions of both nations. Such receptions, such open and generous welcome—south first, then north—as were experienced last week, do much to efface misconceptions, and to bind together great peoples. Nations after all are only composed of units; and every unit filling the position of gas engineer and manager in a city or town is the centre of considerable influence in the community. Not only nationally, but industrially, cultivation of good friendship in this way does immense good. Technical intercommunication is encouraged. The merest survey of all that makes the world's gas industry what it is to-day must assure every British gas engineer that it would not have been what it is without the inestimable advantages that Germany has given it with liberal hand, and every German gas engineer that it would not have been what it is without the bold engineering conceptions and embodiments and the commercial ardour that have been shown in this country. We cannot, in the cause of progress, do without our German friends, nor they without us; and the closer the friendship, the greater the flow from one to the other of all that is beneficial in the common interest.

The German friends who were able to join in the visit last week had thrown open to them every part of some of the largest of our gas-works; and all serviceable information has been willingly and freely given them. That, too, has been the unvarying experience of the British gas men who have visited Germany to learn of their fellow practitioners there. In the large British works that have been inspected during the past week, the visitors have seen much showing differences of method, but all directed to the one common end of economical production; but though they saw differences in plant and in practices, they found no differences in the warmth of the reception and in the liberality of the hospitality accorded them by the Institution of Gas Engineers, the Gaslight and Coke, the South Metropolitan, and the Croydon Gas Companies, and the Edinburgh and Glasgow Corporations. Had these Companies and Corporations vied with each other for supremacy in the degree of welcome and hospitality, not one could have succeeded better than they did. It was all well done; and the gas profession of Great Britain have the satisfaction of knowing that the friendship that formerly existed in the gas industry of Germany is as the result rooted to-day deeper than it has ever been before. We congratulate the two Presidents—Mr. Alex. Wilson and Herr Direktor H. Prenger—the Reception Committee, hosts, and all who took part great or small in the happy work, upon the unalloyed success of the week. Deserving names are too many to mention; but we know it will not create any invidiousness if we give prominence to three who specially distinguished themselves among the workers—Mr. J. W. Helps, Dr. Rudolf Lessing, and Mr. Walter T. Dunn. Glorious weather, too, prevailed throughout the week. Had it been specially selected, the choice could not have been better.

In other columns we have attempted—the occasion we think deserves it—to place on record a fairly comprehensive account of a unique visit and a unique course (for a single week) of gas-works inspection and pleasure. There we may leave the enjoyable task, with before us the pleasant concluding note of Herr Prenger: "We beg to thank you all "for what we have been shown, and for all the kind attention that has been showered upon us. Be assured we take "back with us the most pleasant recollections; and the "memory of it all will remain with us for many years."

Parliament and the Standard Burner.

IN the instalment of our review of the Gas Acts this week, we have introduced a reference to the Standard Burner Bills, as passed by Committees of both Houses of Parliament, and now awaiting final acceptance at the hands of the House of Commons. It will be seen that there are only four Companies who, from one cause or another, left the ranks of the promoting Companies, and so reduced the number to 43, representing (through the three stations included by the British Gaslight Company) 45 areas of gas supply. But the Bills are standing at this point: They have passed through all the formal stages, and have been submitted to most searching investigation by two Committees; and still discontented with the waste and inconvenience they have occasioned, the opponents have obstructed their third reading, and thus the crowning point of Royal Assent.

In our opinion, the opponents are not gaining anything by their action. When the Bills come up for third reading, what will be the attitude of the House generally in regard to them? They were strongly supported by members of the Government and the Board of Trade on second reading; and having been referred, at the express desire of responsible members of the Government, to the investigation and judgment of a Committee of the House, the Government will support the verdict of the Committee, and therefore the third reading. This is customary; and the gas industry's own legislation affords precedent. When the Worthing Gas Bill was before the House in 1907, subsequent to consideration by a Committee, an attempt was made to eliminate certain land clauses that had been the bone of contention before the Committee. On that occasion [the report will be found in the "JOURNAL" for May 7, 1907] Mr. Emmott, the Chairman of Ways and Means, said "it would be a serious "matter to interfere with Committee work by upsetting a "decision come to after such long and careful inquiry as "had been made into this scheme." He added that "there "was no precedent for a Bill which had been passed by a "Committee being rejected by the House; and he hoped "the House would pause before they created one in this "case." The House did pause; and so the House will do again. It will rest upon the opponents of the Standard Burner Bills to show cause why there is anything to differentiate these measures from all others sufficient to subvert the custom of the House, annul all the work expended upon the Bills, and to create a precedent that the authorities of the House are of opinion would be highly dangerous.

That is one serious difficulty those ranked in hostility have to surmount. Another is the amount of precedent that has been created not only in past sessions, but in the present one, for the application of the "Metropolitan" No. 2 burner in testing. The House has not once been challenged during the session, except on these joint Bills, on the subject of the new standard burner; and yet the House has time and again during the session given their approval to measures containing provision for the use of the burner. Above all things, a legislative assembly in its acts should be logical and consistent; and certainly Parliament would not be one or the other if they now disapproved of the jointly promoted Standard Burner Bills. Excluding all count of Provisional Orders, there are at least eleven gas companies and eight local authorities who, in their separate Acts, have had power conferred on them this session to use the "Metropolitan" No. 2 burner for gas-testing. We may name them. In the case of gas companies, the power has been obtained by Bishop's Stortford, Brighton, Bristol, Dunblane, Exmouth, Farnham, Garnant, Gowerton, Great

Grimsby, Havant, and Wicklow. In local authority Acts, the No. 2 burner has been prescribed in the cases of Egremont, Falkirk, Glasgow, Kirkcaldy, Little Hulton, Mallow, Middlesbrough, and Middleton. Prior to this session, it was specified in something like 100 Acts and Provisional Orders. Why was not opposition to the burner raised in the House on all the measures promoted by the companies and local authorities named above; and why were not the verdicts of Committees challenged in the case of all the contested enactments specifying the burner prior to the present session?

The opponents of the joint Bills are inviting the House to indulge in quick changes of legislative front; and this the House will assuredly decline to do on the grounds that there is no precedent for a Bill passed by a Committee being rejected, that to do such a thing would be a serious matter in connection with Private Bill Committee work, that Parliament and the Board of Trade have created much precedent in the matter of the application of the "Metropolitan" No. 2 burner as a standard, that they cannot now go back upon their acts, that the prescription of the burner is just, and that it is a proper burner with which to obtain uniformity in testing for the illuminating power of gas. To refuse to concede the burner now would be to create greater disuniformity than ever.

Lighting Efficiency at Low Pressures.

Little or nothing is heard in these days about improvements in the vertical type of incandescent burner. Whether there is merely a marking of time in relation to them, or whether we have reached the limit of their susceptibility to advance in point of efficiency, is not a matter we need here stop to discuss. The fact remains that we now hear little or nothing of progress in regard to them; and inverted gas-burners are practically sweeping all before them. They are monopolizing the efforts of those who devote themselves to new gains either of efficiency or of movement to perfection, the public like them, they are economical, and they aid decorative and useful effects. They are retaining street lighting against the fierce attacks of the electricity supply industry with metallic filament lamps; and much to their vexation, the competitors find they can only beat the inverted gas-burner by doing the lighting at unremunerative rates. In recent numbers of the "Journal," there has been indication of the successes of the makers in marking progress in the efficiency, and in other respects, of the inverted burner. Defects have been discovered, and remedied; and much has been done in connection with the design of burners to prevent tarnishing of the fittings to which the burners are attached. Their useful range for service has been much extended; and burners are being constructed so that their regulation can be effected at any time. There are burners now, regarded as quite ordinary ones, by which an efficiency, at district pressures, of about 30 candles per cubic foot of gas consumed can be obtained. But the whole of this increase must not be attributed to the burner itself. The normal pressures in gas distribution systems have been raised; and to this some of the higher efficiency of the inverted burners must be conceded. In these days, in stating efficiencies, the pressures at which the testing was carried out ought to be quoted. However, there is progress all round; and a good thing it has been for the high-pressure system that it has won fresh laurels. Otherwise, under the conditions of to-day with low-pressure burners, there would be no justification for putting in compressing plant merely to gain the old efficiencies that were considered excellent in their day. So considerable has been the advance that we have given up thinking, much less talking or writing, of anything being finite in connection with gas lighting.

Professional Auditors and Certain Views.

Sheffield deserves exemption from congressess and conferences for some years to come. Within the space of about six weeks, the city has welcomed within its borders the British Association, the Trades Union Congress, and lastly the Institute of Chartered Accountants. Sheffield no doubt feels highly honoured that there should have been such a raid upon its hospitality by bodies more or less influential, but all seeking to make progress in one or other direction. At the moment, two or three points in the proceedings of the Institute of Chartered Accountants arrest attention. The President of the year is Mr. William Plender, a member of a firm of City Accountants eminent in the financial world, and associated with a number of companies whose affairs come periodically under review in our columns. The address of Mr. Plender showed him to be a man of broad view on financial matters generally; and in respect of current questions affecting finance, he stood free of any party bondage, and above party consideration, and viewed them one by one from the standpoint of the shrewd and independent financial expert. We sympathize entirely with his opinion that it would be better for the country if the makers of legislation would take greater counsel with the expert before framing new laws—framed now in some cases with an utter disregard of the consequences. The point fits in well with the one made in our article last week on "Legislation and Economy," in regard to the revision of the General Gas Acts. "Legislation," remarks Mr. Plender, "has a tendency to become too "parental, to lessen the scope for individuality, and change "the fundamental laws of competition, which in the past "have been healthy incentives for enterprise and inventive-"ness. Not only has legislation in connection with the gas industry had "a tendency" to become too parental of late, but the tendency has for years been an acute actuality; and not only so, but the conceptions and the ultimate formulations of legislation applied to a competing industry have had a disuniformity that has worked disadvantageously to pre-existing industry. In both respects, the burden has been imposed upon the gas industry—wasting much substance and time—of attempting with more or less success, to obtain rectification, and practical and just conditions. Therefore before there is any revision of general gas legislation, it is to be hoped that the Legislature will see fit to take—will see the wisdom of taking—counsel with those who know well from intimate experience the needs of the industry internally and in relation to the requirements of those it serves. Holding the view that this is the proper course in the interests of wise legislation that shall assist, and not be oppressive to, the economical working of industry, we can freely subscribe to Mr. Plender's view that "changes in legis-"lation require to be carefully inquired into by those whose "training and experience qualify them for the purpose, "and the probable financial and economic effects of legisla-"tion considered and appreciated before a change is made "which is irrevocable."

There is another remark in the address which reminds of recent provisions in gas legislation. The "chartered ac-"countant," observed the President, "follows capital on "behalf of shareholders whose capital has been expended." The professional accountant has a just cause of grievance in connection with the auditing of the accounts of numerous statutory and joint-stock enterprises. On the borders of that particular province, the professional accountant has had operating against him all sorts and conditions of men, some of whom are no more qualified to make a thorough and satisfactory examination of a company's accounts than many men engaged in the humblest of callings. The Acts under which numbers of statutory companies carry on their industry and trading make no provision for the appointment of professional auditors; and the shareholders are left to elect whom they choose. All too frequently they are the nominees of the directors; and oftentimes these are the men who have been most generous in the encomiums used in proposing a vote of thanks to the directors for their services. Influence and favouritism go a long way in securing appointment. Yet many of the men so appointed are neither qualified for auditing by training in connection with the enterprise concerned or by training in the art of accountancy for the positions they occupy; and it is by sheer good luck, or through at the helm a board of directors and a staff above reproach, and not by their own knowledge or skill in accountancy, that they escape a position that would bring upon them the reverse of honour. In a measure, there is some responsibility resting upon directors in countenancing such appointments, though, *de facto* and *de jure*, the appointments are the work of the shareholders. But there is no getting away from the fact that boards of directors can, and do in many cases, influence the selection of auditors. But a change is being made in this matter, through many boards of statutory companies realizing that the open door to incompetency is no certain protection either to shareholders or to themselves. It is found a growing feature, therefore, in the Acts of Parliament of, in some cases even long-established, companies that provision is made for the election of auditors who are members of the recognized organizations of professional accountancy; and the provision also, as a

rule, exempts professional auditors appointed from being shareholders, though not objecting to them being so. If they are shareholders, so much the better, though it would be hard to make it compulsory on the professional auditor that he should hold shares in all concerns whose financial affairs it is his duty to check and certify. Such clauses for some sessions now have appeared in Gas Acts; and this applies to the present session. There is one difficulty in the case of gas or other companies who have old-standing auditors, and that is the invidiousness of proposing the change during their tenure of office. This is got over in the Act of one prominent Provincial Gas Company this session, by the provision that only chartered accountants shall be appointed upon the vacating of office by present holders who may not be professional accountants.

But though we write thus favourably regarding the change, it is present in mind as we do so that the names of eminent firms of auditors have been seen upon the prospectuses of certain companies that, from the very outset, have not been above suspicion, and that have eventually proved themselves to be nothing but clever, and often successful, designs for public plunder. Such firms may have lent their names in perfect ignorance of the value and nature of the concern; but we cannot altogether hold them blameless, for their names stand as a sort of guarantee in the eyes of the public, and that is exactly what the promoters of such concerns desire. The eminence and the respectability of the firm of auditors are to them excellent, and yet for the end in view cheaply acquired, tools. It is due both to their reputation and to the public that firms of position in the accountancy world, and indeed all firms whatever their status, should take every precaution to keep themselves aloof from this sort of thing. The whole of their work is covered by the one word "protection;" and the spirit and meaning of that word in its fullest sense should spread through and influence the whole of their professional acts.

A Touching Incident.

In connection with the visit of the German Engineers last week, there was a touching tribute on their part to the memory of Sir George Livesey, who in the German gas profession held the regard and admiration of a considerable number of friends. Tuesday was the second anniversary of the death of Sir George; and early on Wednesday morning the President of the German Association of Gas and Water Engineers (Herr H. Prenger), accompanied by the Vice-President (Herr F. Kordt) and the General Secretary (Dr. Karl Bunte), with the President of the Institution of Gas Engineers (Mr. Alexander Wilson) and the Hon. Secretary (Mr. S. Y. Shoubridge), journeyed to Nunhead Cemetery, and, in the name of the German Association, placed a wreath on the grave of our departed leader and friend. Wreaths were also there from the South Metropolitan and South Suburban Gas Companies

High-Pressure Lighting in Westminster.

Considerable interest has been created by the special article published in the "JOURNAL" for Sept. 27 on the low-pressure inverted-burner lamps in the streets of Westminster. Much inquiry has resulted, and not a few have made journeys to London to inspect what has been done. There has now been a commencement with the high-pressure lighting—Victoria Street being in lighting with twenty-four 1800-candle power lamps. The Institution of Gas Engineers have consequently a good gas lighting exhibition round about their offices—high-pressure inverted lighting in the main street in front, and in certain streets rearward low-pressure lighting.

The Control of Exhibitions.

Interesting and useful as the exhibitions held at the Agricultural Hall, Olympia, Earl's Court, and elsewhere in London and the Provinces are acknowledged to be, those who are compelled, for the purpose of keeping their names before the public, to take part in them are beginning to consider whether they are not becoming far too frequent, and whether they are productive of a sufficient quantity of remunerative business to compensate for the expenditure they entail. Recognition of the advisability of controlling exhibitions was, we believe, one of the causes of the formation of the Society of British Gas Industries; and evidence has lately been afforded that firms engaged in other branches of engineering are impressed with the desirability of following in their footsteps. It is felt that a greater measure of success might easily be secured at exhibitions if the traders immediately concerned had a more distinct voice than they have at present in the general arrangements, especially in regard to the dates for having the displays, instead of these matters being entirely in the hands of private promoters. These views were expressed at a representative gathering of machine tool makers and factors held at Olympia on the closing day of the recent Engineering Exhibition, at which it was unanimously resolved to form a society "for the purpose of dealing with the question of shows and exhibitions;" and a Sub-Committee was appointed to settle details. Temporary offices were secured at No. 22, Henrietta Street, Covent Garden, and Mr. Herbert Page was appointed Hon. Secretary *pro tem.* The Sub-Committee held a meeting early next day; and Mr. Page is now actively engaged in circularizing engineering firms with the object of ascertaining their views as to the advisability of forming the suggested society, and holding a general meeting of members of the tool trade—say at Manchester some time during the forthcoming exhibition in the city. It is felt that only by the co-operation of the whole of the trade can success be secured. The movement concerns a by no means small section of our readers.

Gas v. Electricity at Torquay.

The controversy as to the respective merits of gas and electricity is being carried on with some vigour at Torquay. Stimulated by the advent of a new Engineer, the Corporation Electricity Committee are extending the area in which electricity is used for street lighting, and are generally displaying a more aggressive attitude. On their part, the Gas Company have not been idle. The costliness of public lighting by electricity was commented upon at the recent half-yearly meeting of the Company, and since then a pamphlet has been issued in which the advantages of gas for lighting and heating are described, and attention is drawn to its merits, not only on the ground of efficiency and cheapness, but also from the hygienic point of view. Now the Electricity Committee are to take the field with a reply written by their Engineer, in which it is sought to disprove the statements of the Gas Company. They also propose to open a show-room in the town, and to advertise. As the Chairman of the Committee told the Town Council last week, the electricity undertaking owes something to the newspapers for the free advertisements it gets; and now the newspapers are to receive a little in return in the way of advertisements which are to be paid for. In spite of the great advantage which the electricity undertaking enjoys in the control of the public purse and the public lighting, the Torquay Gas Company have succeeded in more than holding their own in the fight; and they will no doubt be found capable of meeting the new situation which the more active policy of the Corporation has created.

Labour Leaders and their Followers.

Keen interest was manifested in South Wales recently on the question of whether or not the Miners' Federation would prove to have the support of the majority of the members. It will be recalled that in connection with a local dispute the leaders recommended that those thrown out of work should be financially supported from the funds of the Federation and by levy, according to rule; but a section of the members were strongly in favour of all the workmen in the coalfields giving notice to stop work in support of the Cambrian Combine—the collieries where the dispute was in progress. The leaders were thus placed in a difficulty; and, as a way out, they advised the taking of a ballot on the question of which policy should be adopted—*i.e.*, whether the leaders should lead or be led. The voting was duly taken; and the result proved to be a victory for the Executive of the Federation. That is to say, a substantial majority was recorded in favour of the policy of granting financial support to the Cambrian Combine workmen from the funds of the Federation and by levies on the members. The figures were: For a levy, 73,345, and for a stoppage, 42,817; so that the majority in favour of taking the advice of the Executive was a large one. Out of 150,000 members of the Federation, about 116,000 recorded their votes, which means that about 23 per cent. did not express an opinion either way. Though, generally speaking, the public interest in the ballot, of course, centred round the question of whether or not it would result in a strike, the importance of the

outcome as affecting the position of the Executive in regard to the members of the Federation was recognized by those who are specially concerned with organized labour under present-day conditions. For a time, at any rate, matters in this respect will probably go on more smoothly again; but employers must have had their confidence in the ability of the leaders to answer for the members of the Federation severely shaken by recent events. By now everyone is heartily sick of the state of unrest in the coalfields which has done so much for many months past to upset industrial affairs in South Wales; and one would like to be able to say that the outlook was clear once again of serious labour troubles. This, however, is at present impossible. The ballot referred to is against a general strike; but there is still the Cambrian dispute outstanding, and even that is far from being the only cloud on the horizon.

Miners in Conference.

While this undisturbed condition of affairs is causing so much anxiety in South Wales, the Miners' Federation of Great Britain have been holding their annual conference—which took place last week in Edinburgh. Practically every mining district in England and Scotland, we are told, was represented at the gathering; and it was announced from the platform at the opening of the proceedings that the delegates, who numbered 167, were present on behalf of upwards of 600,000 miners. Mr. E. Edwards, M.P., was President; and in the course of his address he dealt with various matters of interest to his hearers. The first thing he advocated was that more care should be exercised in the employment in mining of men who were inexperienced; and he urged that in these days of technical education, money spent in the mining villages on education should be spent in directing the minds of those who were to follow the industry to what were the main features of danger in a mine. Next he referred to the subject of working men inspectors. These, we agree with the President, were questions to which the conference might profitably direct their attention, "because he could not conceive anything more ennobling, any higher function that anybody could fulfil, than seeking to reduce the terrible death-roll, and to save human life." Mr. Thomas Burt, M.P., followed with a remark that "it was almost criminal, in his opinion, where a question could be argued, to appeal to force in the shape of a strike or a lock-out." But, at the same time, he expressed the opinion that strikes were sometimes inevitable, even in these days; and it was a weapon they could not abandon. Why, however, should there ever be a question that could not "be argued?" So long as the Miners' Federation confined themselves to dealing with such problems as those referred to in the President's address, and to furthering by every possible means the level-headed policy of conciliation, there could be no reason on anybody's part to disagree with them. But when it comes to advocating the nationalization of mines, there is not, outside the Federation, likely to be so unanimous a feeling as to the wisdom of the policy of the organization. This is the resolution on the subject which the conference passed without any dissentient voice: "Realizing it is necessary that some very drastic action should be taken, we move that our leaders organize meetings nationally with a view to bringing about the nationalization of the mines, believing it to be the principal means by which the worker can improve his condition."

East Hants Gas Company, Limited.—The prospectus of this Company, the capital of which is £30,000, was issued yesterday. We may possibly have something to say next week in regard to the undertaking; but meanwhile we advise our readers to exercise the strictest caution in investing in it.

Wood-Stave Insulation Joints.—These joints have been substituted for rubber insulations on certain mains of the Metropolitan water system at Boston (Mass.), to reduce electrolytic action. Tests of a 48-inch rubber gasket joint, which had been in service four years, showed considerable electrical leakage, and upon removal was found to be black and hard in spots, with a cinder-like appearance as if it had been carbonized. The positive section of the joint contained numerous pittings $\frac{3}{8}$-inch in depth. A wood-stave joint which was substituted for the rubber joint stopped the further flow of electrical currents. These joints, which were used on all new pipe-lines laid during the past year, according to the last annual report of Mr. Dexter Brackett, the Chief Engineer of the Metropolitan Water-Works, were placed at 500-feet intervals. The pipe sections at the joints differ from the ordinary form only in the bell end, which is cast without a lead groove. Pine staves are used. The cost per joint varies from £2 11s. 10d. for a 60-inch pipe to 18s. 1½d. for a 12-inch one.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 152)

The Stock Exchange was last week furnished with a first-class factor to awake it to life and action, in the form of an actual Continental Revolution. The most singular thing about it was the small effect it had on the markets, and the rapidity with which they resumed their normal levels—a welcome evidence of latent strength. So that markets for the most part closed as well as they opened, and in some sensitive lines even better. The tone on Monday was variable. Misgivings over the Rubber Market certainly had a dulling influence within its sphere of influence. But Government issues were firm. Consols rose ¼, Railways were bright and advancing, and Americans were a little better. Tuesday being the New Year's Day of the Hebrews, business was decidedly limited; but things were steady mostly, though the protraction of the labour dispute irritated Rails. Wednesday was perturbed by the Portuguese drama—the Foreign Market being naturally the centre of weakness—but soon became more calm. Consols touched 79$\frac{15}{16}$; but Rails were firm. Thursday was not at all a bad day, and business was much more active. Consols recovered their set-back; and Rails were cheerful and quite confident of a settlement. The Rubber Market gave better signs. On Friday, the activity of business was well maintained, and the general tone was quite good, in spite of some little Friday realizations. The leading markets for the most part were firm, though the Foreign Market had not quite settled down; and the speculative lines, headed by Rubbers, were cheerful. On Saturday, the tendency was good, aided by the quiet state of things in Lisbon. Consols rose ¼. In the Money Market, the supply was fully equal to all demands, and rates, both for short loans and for discount, eased steadily down. Business in the Gas Market was quieter, and more than usually restricted to two or three undertakings. Unmoved by the fall of a dynasty, everything was very firm, and a few moderate advances in quotation were scored. In Gaslight and Coke issues, the ordinary was quite steady, changing hands only within exactly the same range of prices as in the week before—106½ and 107. In the secured issues, the maximum realized from 87¼ to 88¼, the preference 105 and 105½ (a rise of 1), and the debenture from 80⅜ to 81⅜. South Metropolitan was also unchanged; all transactions being within 121½ and 122¾. The debentures marked 80½ and 81¼. Nothing at all was recorded in Commercials. Among the Suburban and Provincial group, Alliance and Dublin was done at 89¼ (a rise of 1), and Brighton and Hove ordinary at 156¾ to 158. This was all that was done in London; but on the Provincial Exchanges, Liverpool "A" changed hands at 221 (a rise of 1), ditto "B" at 163, and Newcastle at 102—a fall of ½. In the Continental companies, Imperial was quiet at from 187½ to 188¼, and Union was marked at 98¼. Among the undertakings of the remoter world, Buenos Ayres debenture was done at 97½, Monte Video at 12¾, Oriental at 139, Primitiva at from 7¼ to 7⅜, ditto preference at from 5$\frac{3}{16}$ to 5$\frac{1}{4}$, and ditto debenture at 97½ and 98½.

ELECTRICITY SUPPLY MEMORANDA.

A Mistake of the Times—Lost without Undue Cutting—Life of Metallic Filaments—Folly—Stripping Gas to Benefit Electric Lighting—The "Telephone" System of Charging.

There is one egregious mistake the electricians are making at the present time; and it is that they will persist in comparing, in public lighting, the new metallic filament lamps with the old vertical incandescent burner, instead of the newer forms of inverted gas-lamps such as are being used in Westminster and South London, and will soon be in Finsbury, Hackney, Bethnal Green, and Stoke Newington, and probably in other London boroughs. But we hope that even electricians will not be so blind as to continue to live in the bliss that arises from their error, or indifference to actualities. The "Electrician," in their very proper enthusiasm for the electrical cause in the matter of street lighting, have been canvassing electrical engineers for information as to what they are doing in this regard. But they have only published the views of eight borough electrical engineers; and the tale they have to tell is much about the same as a twelvemonth ago. There are two things that particularly strike one about the published responses; and they are that the correspondents are all engineers of electricity undertakings of local authorities who have also control of the street lighting, and that not one of them makes comparison of the metallic filament lamp with the inverted gas-lamp as adapted for street-lighting purposes. We suggest a little more extended inquiry in future. Perhaps then some interesting information will be gathered as to why a difference exists in the matter of the patronage of metallic filament lamps for street lighting purposes by local authorities who own electricity supply and by those who are not influenced by ownership of either the gas or the electricity supply.

Concerning the question of costs, the initial expense of converting gas-lamps to metallic filaments appears to be somewhat high. Mr. George Wilkinson, of Harrogate, speaks of £800 for converting 500 lamps; and we have seen quotations considerably higher than this. It would not cost nearly so much per lamp as these figures indicate for converting from vertical burners to inverted

ones (providing the lanterns were in good order), with a greater resulting efficiency. As to running costs, a significant remark is made in the communication of Mr. H. D. Munro, of Exeter, when he says: "Experience goes to show that a better average light than is obtainable from low-pressure gas mantles can be given by electric metal filament lamps at a cheaper rate, without *unduly cutting* the price of the supply." We take it that Mr. Munro is referring to the upright mantle; and, if so, we are bound to say that his experience does not coincide with our own. But it is the deliberate use of the words "unduly cutting" that is interesting. It shows that there is a cutting of the price; and that the cutting is necessary in order to enable the metallic filament lamps to make any sort of showing as against gas in the public lamps. Therefore, as there is no cutting of price in the case of the private consumers, on the point of economy gas wins hand over hand. About this price-cutting, Mr. Wilkinson, of Harrogate, tells us that the gas-lamps which he is converting (this is an old, old story by the way, and we believe has been published before in the "Electrician") used to cost the Corporation, including everything except labour, cleaning, and lighting, 17s. per lamp per annum, whereas the Electrical Department can supply the Corporation at 11s. 2½d., including lamp renewals and everything excepting cleaning and lighting. Mr. Wilkinson does not say anything about undue cutting of prices; but as we gather the street lamp metallics are supposed to be of 55-candle power, it may be taken that the consumption of energy per hour is 70 watts. The lamps are extinguished at about 12.30. The lighting hours in a year from dusk to 12.30 number 2355; and therefore at least 165 units of electricity per lamp would be required in the time. Assuming the number of hours mentioned represent the average life of the metallic filaments, and that 3s. 9d. only has to be spent on renewals from the 11s. 2½d., this will leave 7s. 5½d. for the electricity, which, on the foregoing figures, equals 0·5d. per unit. This is what has to happen to compete with gas for public lighting; and yet the "Electrician" protests against gas people claiming that gas is, using modern burners, cheaper than electricity for lighting purposes! Now at Harrogate, the Corporation are going to pay 17s. per annum for the metallic filament lamps; and the difference between this sum and the 11s. 2½d. is to be devoted to paying off the cost of conversion. If all the difference is devoted to this purpose, it will take five-and-a-half years to discharge the £1 12s. per lamp, or in the total £800, expended in making the change, not countiug anything for interest and depreciation. As to the comparative photometric tests published by Mr. Wilkinson, we may set against them the sale by the Gaslight and Coke Company of illumination in Westminster under penalty for deficiency. The photometrical tests of gas-lamps by central station engineers always show remarkable vagaries. But there we can afford to forgive them, seeing how they have to cut and work in order to show an apparent economical front to their own masters.

The communications in our contemporary also boast about the life of metallic filament lamps; and there is great talk about their "average life." It is necessary to speak of the "average," which seems to generally be placed at something like 2200 hours. In relation to the life of the lamps, the cost has to be remembered. There are electricians who speak of the renewal of a mantle as being something analogous to the renewal of a metallic filament lamp, forgetful that the one to street-lighting authorities costs two or three pence, against as many, or more, shillings in the case of the metallic filament lamp. Mr. Christie, of Brighton, is of opinion that "the average life of the best makes of these lamps is not so good as it might be; and he thinks the high efficiency of a little over 1 watt per candle power might be sacrificed to a small extent with advantage both to the lamp-making industry and to the user if a longer life could be assured." Mr. H. Cameron, of Penarth, states that the average life may be put at between 1500 and 2000 hours; so that there is disagreement as to what the lamps will actually accomplish in the way of an active existence. But Mr. A. Dimmack, of Swindon, shows how erratic is the life record of his lamps, by giving the following table of failures:

Between	0	and	110	hours	27 lamps
,,	100	,,	200	,,	23 ,,
,,	200	,,	500	,,	61 ,,
,,	500	,,	1000	,,	59 ,,
,,	1000	,,	2000	,,	76 ,,
,,	2000	,,	3000	,,	62 ,,
,,	3000	,,	5000	,,	45 ,,

The way that the metallic filament lamp is replacing electric arcs in the street is illustrated by Mr. A. C. Cramb, of Croydon, who states that he has scrapped 255 450-watt and 650-watt alternating enclosed arc lamps; and their place is now occupied by metallic filaments. Even the much-lauded flame arc is making but poor headway what with high-pressure and other high-power gas-lights, and what with people's preference, if they use electricity, for metallic filament lamps. The "Industrial Supplement" of the "Electrician" has brought out, as it has done before, a "special" on flame arcs. We have been through the material in the pages, but cannot find any notable improvement in flame arcs to talk about. Indeed there seems on this occasion to have been some difficulty in filling up the space of the supplement, as no less than five columns are devoted to a "tragedy" in two acts headed "Gushem's Gas Arcs." Gushem is supposed to be a successful draper, but weak on the point of safety of his premises and his employees. With the horrors of Clapham and Accrington so near at hand, and with a proper appreciation of the uses to which columns designed for technical matter should be devoted, one can hardly imagine the editor of an electrical paper permitting such foolery as this being published. But simultaneously with the endeavours of one of the technical papers of the electrical industry to advance interests and business by sportive means, the gas-lamp makers are running their works and men at high speed; while at a gas-works recently, a fitter came in to see whether there was a job going, as he had been discharged, through slackness of work, from the local electricity supply undertaking. Are there many more electric lamp fitters swelling the ranks of the unemployed?

There has frequently been protests in these columns against the unfair treatment of gas by some local authorities who have control of the street lighting. They do their utmost to depreciate, through the public lamps, the value of gas as an illuminant, and to do all they can to make the electric lighting look worth the money; or they operate to save on gas, in order that they may equalize things a bit, owing to the heavy expenditure on electric lighting. A protest from a correspondent has appeared in the "Bristol Times and Mirror" against the poorer lighting than formerly of Bristol streets furnished with gas-lamps. According to him, the local authority have been effecting savings by introducing, a year or two ago, smaller gas mantles, and by abolishing bye-passes. The gas-lamps, he also says, are now lighted half-an-hour later and extinguished half-an-hour earlier than previously. But why this economy in a city like Bristol? The correspondent thinks the Corporation should be emulating the authorities of London by putting in inverted gas-burners on the low-pressure system in the side streets. But (let him have his own say) "instead of this, the great majority of the streets of the city, or, in other words, the 'gas lighted' streets, appear to be starved for light, and every little saving that can be effected by reducing illuminating power, or the foolish practice of very late lighting, &c., that I have referred to, is adopted, to weigh against the abnormal cost of electric lighting in the centre of the city. This is a matter for the working classes, especially on two grounds—that of sensible economy and of comfort." Diminishing the expense of gas lighting to help to pay the abnormal costs of electric lighting may seem clever to the responsible authority, but it is not politic.

It will have been noticed in the reference last week to the alteration of the tariff of the Metropolitan Electric Supply Company that it has been decided by them to, in addition to the higher flat-rate, adopt the "telephone" system of charging. But contrary to the practice of Marylebone, the Company have resolved to charge, beyond the fixed rate per quarter, 2d. per unit for a specified number of units in the quarter, and 1d. per unit for consumption in excess, instead of a level 1d. for all units. In a comment on the subject, the "Electrician" rather thinks that, if there is to be modification of the "telephone" system of charging [to talk of modification suggests that householders are not falling over each other in their eagerness to come under the system], it would be better to abandon the fixed quarterly charge, and merely to charge a predetermined number of units per quarter at a higher figure—say, 6d. per unit; all units in excess being at 1d. The tariff struggles of the electricity industry have afforded much diversion to onlookers, and to the central station managers much perplexity; and apparently the end is not yet. Defending the St. Marylebone system, Mr. A. Hugh Seabrook has written to our contemporary to say that the difficulty of its proposal "would be (as was found in the maximum demand system of 8d. and 1d.) that the consumer does not know when he is getting off the 6d. units and on to the 1d. ones. Practically no consumers ever read their meters, although we endeavour to get them to do so. When the consumer has paid his annual or quarterly charge under the 'telephone' system, he then knows that the whole of his units supplied are at 1d. each." So there is disagreement between Mr. Seabrook and our contemporary. The latter, however, stick to their point. They do not see that "the consumer would have any difficulty in appreciating a tariff in which a predetermined number of units were charged at a higher price. If, for example, the first 30 units in a quarter were charged at 6d., the consumer would know that he would have to pay 15s. before getting on to the penny rate. It might, of course, be a stipulation that the consumer would have to pay for this number of units in any case as a minimum, though it is doubted if this would be the wisest course to adopt. It will be seen that the payment of a predetermined number of units in this way is much the same as the 'telephone' tariff, only the consumer pays when he has had the units, instead of paying to a large extent in advance."

Illuminating Engineering Society.—The date provisionally fixed for the opening meeting of this Society for the coming session is Tuesday, the 8th prox.; and it is expected that the first two papers to be taken will be on "The Present Status of Gas Lighting," by Mr. F. W. Goodenough, and on "Recent Progress in Electric Lighting," by Professor E. W. Marchant.

More Gas Publicity.—In the "JOURNAL" last week, attention was called to a very effective page advertisement by the Gaslight and Coke Company in the first Woman's Supplement to "The Times." The second number, issued last Saturday, contains another, equally good, illustrating and emphasizing in a few appropriate sentences the convenience of gas for the lighting and warming of billiard-rooms.

GAS AT THE MEDICAL EXHIBITION.

THERE was held last week at the Horticultural Hall, Vincent Square, Westminster, the sixth of the series of London Medical Exhibitions organized by the "British and Colonial Druggist"—a fixture which, by reason of the number of doctors who attend, forms an eminently suitable occasion for urging the claims of gas to attention on just those grounds which are likely to appeal to the profession. It is customary at these exhibitions to find the Gaslight and Coke Company in possession of a stand; and it was pleasing to note this year proved no exception to the rule. Conveniently placed (with plenty of wall space above, on which was a handsome banner setting forth the favourable opinions regarding gas which are so extensively held among medical men), the Company's stall contained a very attractive selection of gas-fittings, with switches for lighting and extinguishing purposes. There was also a counterbalanced medical and dental bracket, with upright incandescent burner. In the heating department, a Wright "Druid" stove was shown, in armour bright finish; and a Richmond "Bavarian," in green enamel, with a boiling-burner on top. There was an "Avon" water-heater; and a nice little model of a Wright gas-steam radiator. In the way of smaller goods was noticed the "Q.B.K." quick boiling-kettle, which is fitted with an iron jacket, to keep the bottom off the stove and so cause all the heat to circulate round the body. By this means it is claimed that a kettle boils in one-third less time than under the ordinary plan, lasts twice as long, and retains the heat for a considerably greater time. The principle can also be adapted to saucepans. In other directions, too, gas was well represented in the exhibition; for, in addition to the Gaslight and Coke Company's stand, there were three other stalls immediately connected with the industry. The Telephos Company demonstrated their well-known system of switches for gas lighting and extinguishing at one excellently appointed stand; while next to them there was an imposing display by the Clark's Syphon Gas-Stove Company, Limited, whose new season's patterns of heating apparatus were noticed in the "JOURNAL" on the 27th ult. (p. 839). In addition to these, there was a stall on which Messrs. James Stott and Co. displayed their patent gas-governors for burners, cookers, and fires. Altogether, therefore, the gas portion was by no means the least prominent in a representative exhibition of goods likely to be of interest to the medical profession.

GAS ACTS FOR 1910.

[THIRD ARTICLE.]

CONTINUING our notice of the measures promoted this session by statutory gas companies, we have next before us the Standard Burner Bills, as amended in Committee. On the title page, they are described as Acts; but they yet await third reading and Royal Assent. From the first schedule of No. 1 Bill, the Brentford and Wandsworth Gas Companies have dropped out; and from the first schedule of No. 3 Bill, the Gloucester and Newport (Mon.) Companies. Therefore the promoters now number 43, instead of 47; and the number of districts referred to (the British Company dealing with three of their stations) is 45, instead of 49. The names of the promoting Companies now stand as follows:

No. 1 BILL: Croydon, Hastings and St. Leonards, Ilford, Liverpool, Maidenhead, Scarborough, Swansea, and Torquay.

No. 2 BILL: Berkhampstead, Bournemouth, British (Potteries, Trowbridge, and Holywell stations), Cambridge, Chiswell, Loughton and Woodford, Faversham, Harrow and Stanmore, Hatfield, Hemel Hempsted, Herne Bay, Newmarket, Ormskirk, Prescot, Radcliffe and Pilkington, Reading, Shrewsbury, Tunbridge Wells, Waltham Abbey and Cheshunt, West Kent, and Worthing.

No. 3 BILL: Aberdare and Aberaman, Bath, Exeter, Godalming, Guildford, Hampton Court, Ipswich, Mid-Kent, Plymouth and Stonehouse, Richmond, Romford, Southampton, Walton-on-Thames, Weston-super-Mare, and Wolverhampton.

It is proposed that the Acts shall come into operation on Jan. 1 next; and that, from that date, the "Metropolitan" No. 2 burner shall supersede the present test-burners of the promoters. The conditions and method of testing are defined by each Bill. The only change in the terms of No. 1 Bill is the addition of a clause providing that "the testing-place of the Liverpool United Gaslight Company at their works at Linacre shall be a prescribed testing-place for the purposes of the Gas-Works Clauses Act, 1871." And in No. 3 Bill, there appears this new clause: "Nothing in this Act contained shall, unless otherwise agreed between the Mayor, Aldermen, and Burgesses of the Borough of Richmond, Surrey, and the Richmond Gas Company, apply to or affect the Borough of Richmond in the County of Surrey." [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Great Grimsby Gas Company by their Act have secured the extension of the limits of supply so as to embrace Ulceby, North Killingholme and South Killingholme, and Aylesby, Habrough, Healing, Immingham, and Stallingborough. In the new limits a sum of 6d. in excess of the ordinary price of gas may be charged; but this is not to be taken into account in calculating the dividends. The additional capital powers granted are to the extent of £120,000, of which not more than £40,000 may be raised by way of preference shares. The new auction clauses apply to the issue of this capital. Borrowing powers to the extent of one-third are, as usual, allowed. Provisions as to reserve and special purposes funds are included in the Act. Lands are scheduled for use for gas and other storage purposes. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. In provisions relating to the Directors, it is observed that "the continuing Directors may act notwithstanding any vacancy in their body, but so that, if at any time the number of the Directors of the Company holding office shall be less than five, the Directors shall not, except for the purpose of filling vacancies and allotting shares to any proposed director or directors, act so long as the number is below such minimum." The appointment of a Managing-Director is provided for; and the Directors are given authority for fixing the remuneration of the Secretary. Any future auditors of the Company are to have professional status as such. Protection is given to various local authorities and companies. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Shirebrook and District Gas Company have obtained the desired extension of their area of supply. Now it includes the parishes of Cuckney and Norton, the remainder of the parish of Warsop not included in the area of supply of the Company as defined by their Act of 1899, and specified parts of Bolsover. The provisions of the Mansfield Gas Act of 1878, and of the Mansfield Corporation Act of 1901, so far as they relate to the part of Warsop now annexed by the Shirebrook Company, are repealed. The Warsop District Council are invested with the right, at any time after the expiration of twelve years from Dec. 31 next, of purchasing, with the consent of Parliament or the Local Government Board, and by giving six months' notice, the portion of the Company's undertaking in their area. The provisions of the Bolsover Gas Order, so far as they relate to the parts of the parish of Bolsover included in this Act, are also abrogated. The Act is heavily padded with clauses for the protection of railway companies and local bodies. By the Act the Duke of Portland also retains his right to construct gas-works or electricity generating stations in the parishes of Cuckney and Norton, but a condition is that, in the event of his Grace undertaking such supply, he will first purchase the portion of the Company's concern in the district in question, but the agreed or arbitration price is "not to include any consideration for loss by severance, or any consequential loss." Then the Duke has also arranged that the price to be charged by the Company for gas supplied and for gas meters and other fittings within either of the parishes is not at any time to exceed the lowest current rate for the time being charged in any other place situated within the limits of supply of the Company. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

WE may also commence to-day the review of the Acts of local authorities dealing wholly or in part with gas supply. Two of the measures originally noticed have gone—that of the Bishop's Stortford Council, and that of the Hoyland Nether District Council; the first having been sacrificed by the Council themselves, and the second rejected by the ratepayers.

The Bradford Corporation Act confirms the agreement entered into between the Corporation and the Trustees under the will of the late Sir Henry W. Ripley for the purchase of the private gas-works belonging to the estate. But the Corporation are not, unless authorized by Parliament so to do, to manufacture gas on any lands vested in them under the agreement. The arranged purchase price is £15,000; and power to borrow this sum is granted among the other money powers included in the present Act. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Act of the Egremont District Council confers upon them powers for the transfer of the undertaking of the Egremont Gas Company and of gas-pipes (in the prescribed area) of the Cleator Moor District Council and Whitehaven Rural Council. Agreements for the various purchases are scheduled. The first shows that the consideration for the sale of the Egremont Gas Company's undertaking is £6500, and such sum as shall be agreed upon, or, in default of agreement, fixed by arbitration, as the price of the coal, coke, gas, lime, and residuals. The price to be paid to the Cleator Moor Council is £579 10s. 7d.; but the transaction with the Whitehaven Council only involves the sum of £10. The power of the Cleator Moor Council to supply gas within the Council's limits is repealed. Protective clauses are given in the case of the Wyndham Mining Company, Limited, and their co-owners, and to the London and North-Western and Furness Railway Companies. Power is also included to construct a new road and to stop up another; and compulsory purchase authorization for land is also accorded. The prepayment meter clause appears in the ordinary form. The limit prescribed for the price of gas is 5s. 6d. per 1000 cubic feet. The old 10 and 15 per cent. discounts clause appears. The prescribed standard of illuminating power is 14 candles, tested by the "Metropolitan" No. 2 burner. Power to borrow the sums necessary for the purchase of the concern and land is granted; as well as £8057 for new works, and £500 for cookers, engines, stoves, and meters. The repayment term allowed for loans for works purchase and new works is thirty years, for the money required for land forty years, and for that to be spent on cookers, engines, stoves, and meters ten years. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

THE VISIT OF THE GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

[Brief Descriptions of the Works Inspected Appear on pp. 117-122.]

REVIEW OF THE WEEK'S PROCEEDINGS.

THE visit of the German guests of the gas profession and of the gas industry of Great Britain has ended; and they have left our shores with their friendship intensified and the ties of a common interest strengthened. They came to learn; and they have not been disappointed. They came expecting a cordial welcome; and it has been such that they have left us feeling a oneness with the British gas profession and interest that memory will not allow to be obliterated. Their coming was referred to in last week's issue; and the names of the guests, from the President of the German Association (Herr H. Prenger), the Vice-President (Herr F. Kordt), and the General Secretary (Dr. K. Bunte), through the alphabetical list of representatives of ordinary members, were also then recorded, though four of those named were unfortunately in the result unable to make the journey.

As the mind is cast over the doings of the week, the programme was so full, the events so numerous, that the circumstances of the six days present a mass of matter to be recorded that is almost bewildering; and the task of even lightly sketching it all—with a due sense of its worthiness, both in view of the occasion, and of the thorough manner in which those who took the prominent part of hosts spared neither pains nor expense to perform the honours in royal and loyal way—seems almost an impossible one But the attempt has to be made; and any deficiency must be attributed to the whirl of the week's doings. The first half was spent in London; the greater portion of the second half in Scotland.

AT THE BECKTON, KENSAL GREEN, AND FULHAM GAS-WORKS.

Monday morning broke in a manner that gave fine promise for the week. The weather prophets had been in pessimistic mood; and their predictions of bad weather seemed likely to be verified when the rain storms and succeeding slowly moving clouds of Sunday evening were watched as something unpleasantly ominous. But Monday morning changed this; and as the visitors, with the President of the Institution of Gas Engineers (Mr. Alexander Wilson), the ex-President (Mr. James W. Helps), one of the Vice-Presidents (Mr. R. G. Shadbolt), the Honorary Secretary (Mr. S. Y. Shoubridge), and several other members of the Reception Committee (see p. 19 of the "JOURNAL" last week), were boarding the thirty or so motor-cars that had been chartered for easy locomotion, the sun was shining generously, and the spirit of cheerfulness abounded. The Secretary (Mr. Walter T. Dunn), who seemed to be wanted by everybody, and had details and answers for all in readiness at the tip of his tongue, at last succeeded in getting all comfortably seated to commence the prepared programme. The Gaslight and Coke Company were properly the hosts of the daylight hours of the first day; and Beckton was the first objective. The party were soon whisking past the Abbey, the Houses of Parliament, along the Thames Embankment, through the busy City streets, and then (it was a sort of transformation scene for the visitors) into the depths of East-end life, through Commercial Road East, Limehouse, Poplar, past the great docks, catching a glimpse of the Stepney works of the Commercial Gas Company, and then along the Barking Road, through Canning Town, till at length the Beckton Road was reached, and beyond the extensive wastes of flat low-lying land were seen the numerous shafts of the great chemical and gas bye-products works of the Gaslight and Coke Company, and hard by them the works which, for magnitude, occupy the premier position among the gas-works of the world. The visitors passed first into the tar and ammonia works; and there they were met by Mr. T. Wilton, the Manager. But among the first cars came others, containing the Governor of the Company, Mr. Corbet Woodall (whose name is as a household word among Continental engineers), colleagues of his on the Board, and the chief officials. In the crowd were noticed the General Manager (Mr. D. Milne Watson), the Chief Engineer (Mr. Thomas Goulden), the Secretary (Mr. Henry Rayner), and the Engineer and Manager of the Beckton station (Mr. J. N. Reeson). There were also the Engineer of the Distribution Department (Mr. H. S. Reeson), the Controller of Gas Sales (Mr. F. W. Goodenough), and—well, there must be some limit to the naming even of all those whose sole duty on earth for the time being appeared to be to interest, instruct in practices, and entertain those who had travelled to this country for these very purposes.

Placed on view were many noble-looking samples of the products of the far-famed works, the plant and processes of which were next to be examined. The manufactures here are much too numerous for mention; and the plant by which the tar, ammonia, and cyanogen products are made, too extensive for description. The visitors were aided greatly in their inspection by the excellent "Handbook" on the works to be visited, prepared (at the request and at the expense of the Reception Committee) by Dr. Rudolf Lessing, and in constant evidence during the week. The visitors glanced at the pitch-beds with an aggregate capacity of 30,000 tons, at the stills for the distillation of 18 million gallons of tar annually, storage tanks for many purposes were pointed out, and anthracene, naphtha, and light oil plant was viewed. The buildings in which the distillation of benzol, toluol, and naphtha (about 120,000 gallons a year) is carried on were next inspected, as was the one where the manufacture of napthalene in various forms is conducted, to the extent of about 2000 tons annually. The plant for the manufacture of anthracene and anhydrous ammonia was examined, as were also the stills for the distillation of carbolic acid with a capacity of 2000 tons annually. Some 41 steam-boilers came under notice, as well as the ammonia stills and saturators capable of manufacturing 24,000 tons of 25 per cent. sulphate of ammonia annually. The sulphuric acid plant was inspected; and the men's dining-hall claimed interest.

From the Front of the Cover of the Souvenir, Designed by Mr. F. D. Marshall.

All were pleased. Such an extent of tar and ammonia products works impressed the visitors with the magnitude of the Company's operations; and among those who had known these and the Beckton works in days under a different *régime*, there was expressed a view, well put by one of the visitors, that in years past the place and plant looked as though they were begging for an owner, but now they look like someone's property. The statement may seem a little overdrawn; but it is expressive of the policy of proper upkeep and order that rules in the works of the Company to-day. While going round the works, it was learned that among the company present was Mr. Clarke, the Vice-President of the Brisbane Gas Company. And it was also seen (as proved to be the case) that the visitors would during the week be under an obligation to Dr. Lessing, Dr. H. G. Colman, Mr. A. F. P. Haymann, and Mr. H. F. Andressen, for their work as interpreters throughout the visit. By this time several additional visitors representing London gas supply had joined the party—specially welcomed were the South Metropolitan Gas Company's Chief Engineer (Mr. W. Doig Gibb) and the Secretary (Mr. F. M'Leod).

Once more the motor-cars were mounted, and a few minutes' run brought the visitors to the low-level line on the Beckton Gas-Works. Mr. Reeson and his Deputy (Mr. A. H. Solomon) shared with the Governor the honour of showing the members the plant

for conducting the vast operations of these works. Time would not permit of a perambulation through Beckton on foot; hours upon hours, and not minutes, being required for any such proceeding. But prevision had thoughtfully arranged for trucks, with seats and handrails, to draw the visitors from the low-level railway to the high-level line which runs, horseshoe fashion, from pier to pier, passing *en route* through the several retort-houses, which have to be numbered for convenience in locating them and giving them some sort of a designation. There is not going to be any attempt at description of the works here. Beckton cannot be described in few words; and such brief outline description as appears elsewhere is nothing more than a hasty view from the distance. The trucks were mounted at the entrance to the works; and there, on a large tablet attached to the office, something was learned of the origin of the works which may not have been known before by some who saw it. It was seen by them that Mr. F. J. Evans was the first Engineer; and that he laid the foundations of this huge creation of works for gas manufacture. The party were soon on their way up the incline leading to No. 2 pier; and the operation of unloading coal by means of hydraulic cranes and grabs was inspected. It was remarked that nothing in a small way is done here; it is all bulk work. Travelling upon the high-level line, a view was obtained of all sorts of plant —storing, pumping, and condensing; and then on the overhead line the visitors were taken through retort-house after retort-house, some at work, some not, and one under complete internal reconstruction. From the height the party looked curiously at the forest of ascension and arch pipes that met their view as they entered one house after another. They also looked curiously at the sight on the working stages. In one of the houses (No. 5), which contains some 300 retorts, the train stopped with its living burden; and the "burden" watched the operations of West's compressed air pusher and scoop. On went the visitors, making a call at No. 1 pier, and seeing some other parts of the buildings and plant *en route*. Then the tour through the upper part of the retort-houses was resumed. No. 12 house was seen to be in process of reconstruction—to contain, when finished, 44 settings of tens. Here the visitors were invited to descend and examine the constructional work—an opportunity of which they availed themselves with alacrity. They were soon inside as well as outside the settings, and took very keen interest in thus being able to examine the work as in the hands of British retort-setters. Altogether, they had seen houses capable of producing 58 million cubic feet of gas per day. Several other parts of the plant were inspected, from the distance, on again mounting the "train." But descent was made to specially visit the carburetted water-gas plant, which is capable of producing 14 million cubic feet per day. The visitors saw the first sets of such plant that were constructed on the return of Mr. Corbet Woodall and the late Mr. G. C. Trewby from their memorable visit to America to investigate the system. These were the first sets erected in this country; and in this same house they have been extended by additional sets to the aggregate capacity mentioned. But the Governor pointed out that Mr. Goulden is going to carry out some extensions there from one end of the house, by putting in (he was understood to say) three new double sets and a large additional boiler power. Then he will work backwards, and the original sets will be replaced. The party got back to the entrance of the works, where there was a review of some 32 locomotives, and the horses attached to the works. The visitors admired the display, and remarked upon the excellent condition of the locomotives and the horses, as well as upon the pride the men obviously took in their charges.

A Luncheon.

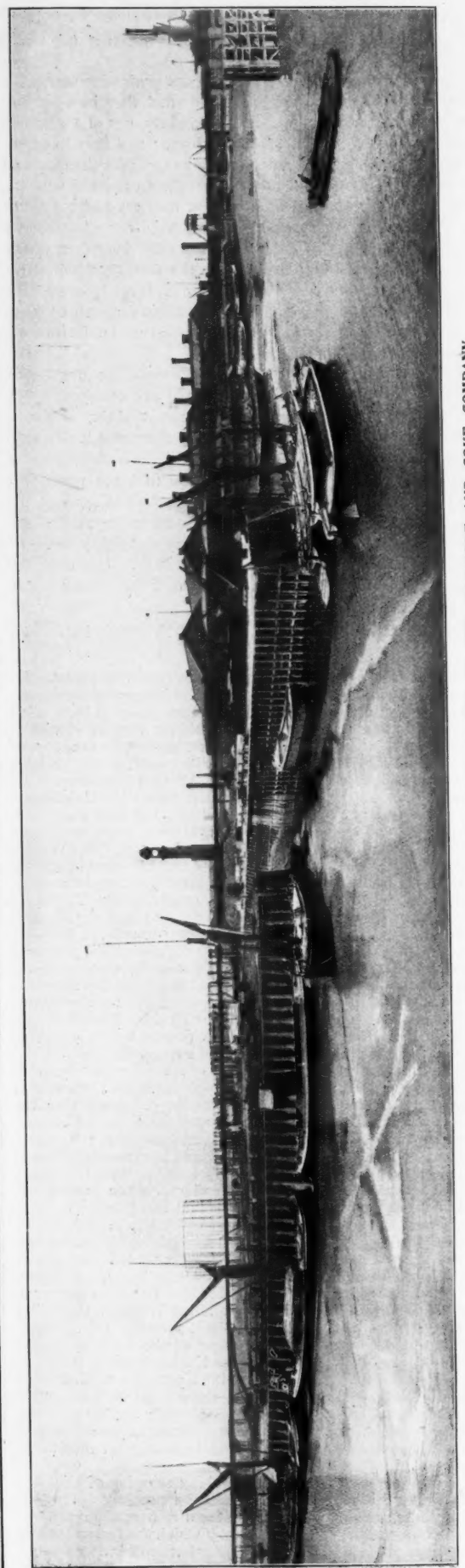
Here we were at "Blackleg Square." This is the original name of the barrack-like buildings that were put up by the Company in those turbulent times in the eighties. Fortunately, they were not required; and ever since then the places have been put to use that savours more of peace than of war. In one of these buildings lunch was to be served; but before this was done, the visitors made a raid on the lavatories, for the purpose of restoring the natural aspects of their faces. High-level railways through live retort-houses, where dust and smoke prevail, while all right for trucks containing coal, are not the most suitable places for a number of gentlemen arrayed in faultless attire. But everyone took it as an inseparable part of the day's outing; and soon normal aspects were restored, and some of the party were spending the few minutes' interval in making use of the Beckton Territorial rifle-range—competing against the Honorary Colonel (the Governor of the Company); the works band the while playing the National Anthem of Germany. They were highly complimented on their performances during luncheon and after.

The interior of the building in which the visitors were entertained was gaily decorated for the occasion—the German and British flags being mingled together in a fashion signifying close and friendly relations. At the back of the Governor's chair, too, were photographs of King George and the Emperor of Germany. To the right and left sides of the Governor sat Herr Prenger and Mr. Alexander Wilson—the two Presidents.

The luncheon was excellent; and after the long morning's outing, it was vastly enjoyed. Subsequently, the assembled company settled down to the exchange of a few complimentary speeches and toasts.

Speeches at the Luncheon.

The Governor said that one or two toasts must be drunk before separating. This gathering was to have been held earlier in the year,



A GENERAL VIEW FROM THE RIVER OF THE BECKTON WORKS OF THE GASLIGHT AND COKE COMPANY.
[*Photographed by Mr. J. N. Reeson, Engineer of the Station.*

THE PIERS AND HIGH-LEVEL RAILWAY AT THE BECKTON WORKS.

but was postponed by reason of the death of our late King Edward, of honoured memory. None of those present would forget the kind and gracious words in which their friend Professor Bunte wrote and expressed his sympathy, and that of the German Association of Gas and Water Engineers, with the British nation and the members of the gas profession in their loss, at the same time offering to postpone the visit. This incident was one of those things they, as British subjects, would remember a long time. But "The King is dead; live the King." He asked them to drink to the health, long life, and prosperity of George the Fifth, the nation's present gracious King.

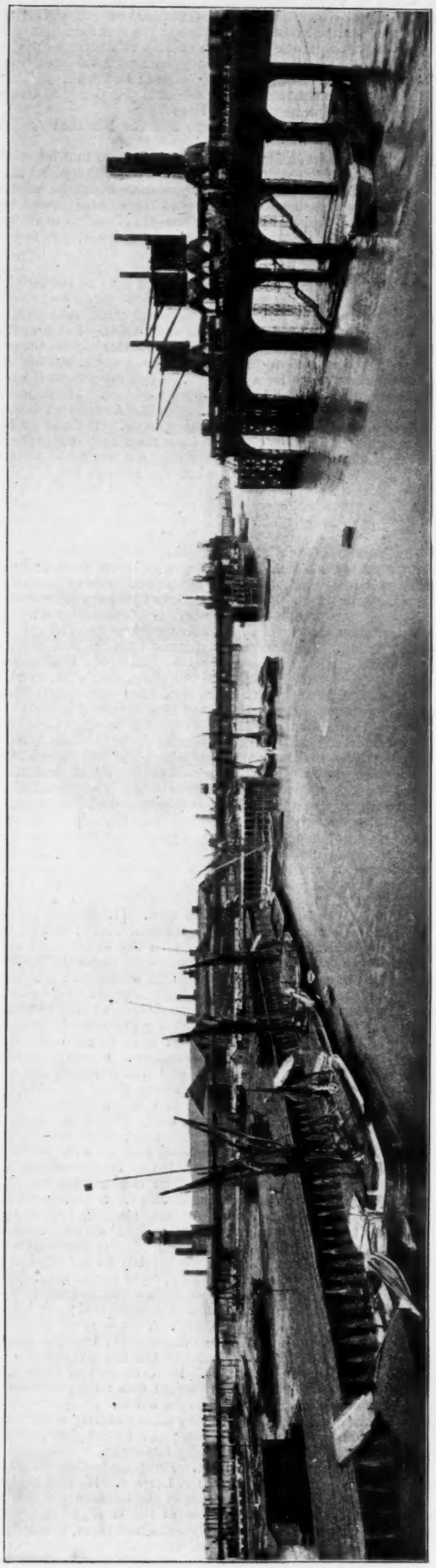
Most heartily was the toast honoured, and the National Anthem sung.

The GOVERNOR said he had next to ask those present to drink to the health of the German Emperor. It was, he remarked, difficult for them nowadays to realize that the mighty empire over which he reigned had no existence within the lives of most of those there assembled; that it was a creation of but yesterday. Even the Kingdom of Prussia they regarded, from the standpoint of their British Royal institution, as a modern creation. When, however, there was no German Emperor, when there was no King of Prussia, there was still the House of Hohenzollern, willing and able to give a strong lead in the people's struggles. The Kaiser was at the head of the most magnificent army the world had ever seen probably in numbers, and certainly in training and equipment. He is a soldier by birth and choice. But the army had never been used except for the purposes of defence and for the protection of the Empire. It had never been used—great as the temptation might well have been—for aggression. Germany was, as it were, the "strong man armed" who kept his house in peace. The Emperor was not merely master of a great army, but he had a care for the commerce, industry, and manufactures of his people. He had spoken freely to his people of the aims he would have them keep before them; and these aims had always been high, noble, and worthy of a great nation. He (the Governor) felt that when the story of the Emperor came to be told in the days to come, his name would hold high place among the kingly men and manly kings of the great race from which he came. He gave them "The health and long life of the German Emperor."

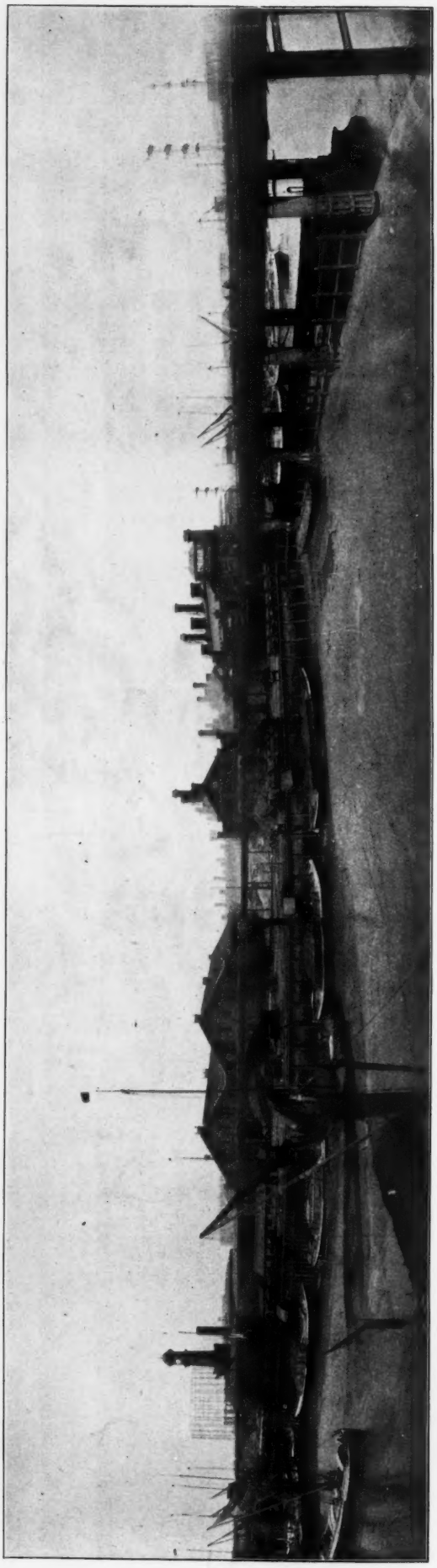
With great heartiness the toast was drunk.

The GOVERNOR remarked that he had now to invite them to drink "Prosperity to the German Association of Gas and Water Engineers." He said the Directors of the Gaslight and Coke Company did not dwell upon the fact that their guests were members of a technical institution; this would be rather the lot of those who would be entertaining the visitors that evening. The Directors welcomed them as men engaged in the same industry with themselves, and as citizens of a kindred race with whom they were glad, and all good Britishers were glad, to cultivate relations of greater amity and friendship. They remembered with keen satisfaction the hospitality which had been extended to them and to their officers when they had visited Germany in search of information. He remembered attending one gathering of the German Association. Immediately on his arrival at about nine o'clock at night he was taken to a conversazione where there was capital music and much good fellowship; and his recollection was that the festivities did not close—there were interludes for serious work—for some 48 hours, when he left by train at eleven o'clock at night. [Laughter.] Talking it over with a friend who happened to be the President of the Association, he (the Governor) said he had been trying to discover an explanation of the method upon which the meetings were conducted; and he had come to the conclusion that they were run in the interests of the younger members of the profession—because every annual gathering must kill off a large percentage of the older men. [Laughter.] Their friends had just inspected the Company's Beckton works; and he had an uncomfortable feeling that they would go away with a sense that, after all, while it was all very big, it was somewhat commonplace. It must, however, be borne in mind that the works were built about forty years ago. They were commenced about the same time that he came to London as a young man, but yet old enough to take charge of one of the largest of the undertakings then supplying gas to the Metropolis. What was done at that period was the last word in gas-works construction and in the science and art of gas making. It was now somewhat out of date. At a period less than half that which he had just mentioned—that was to say, only some fifteen years ago—the late Mr. Edward Drory and he (the Governor) were laying down the lines of the large works at Mariendorf. These works placed the name of Edward Drory high among engineers; and many were the pilgrimages made to Mariendorf to see the inclined settings with which he had equipped them. The pilgrimages to Berlin continued, but the old shrine was deserted, and homage paid at that set up by Ernst Körting. The vertical had replaced the inclined. Somewhat of the same thing had been happening here. As their methods had become out of date, they had been engaging in the work of reconstruction, of which they had seen something that morning. Their practices were not exactly those of the latest German works; but he did think that, from the point of view of economical working, there was little to choose between them. He had mentioned these little episodes because they marked the fact that gas engineering had not stood still; the march of progress had not by any means finished. They were on the road to improvements—not simply in retort-house work, but throughout the works and in the utilization of gas; and the improvements were sometimes of a very striking character. In them, he was quite sure the German Gas and Water Association would take their part. They knew that the gas industry in one country could not prosper without the other prospering also. Therefore they most sincerely wished the German Association every possible success; and he coupled with the toast the name of Herr Prenger, the worthy President.

Herr PRENGER acknowledged the toast. He spoke in German; and his speech was afterwards translated by Dr. Lessing. He said his best thanks and those of the members generally of the German Association were due to the Governor and Directors of the Gaslight and Coke Company for the very kind reception they had given them, and for the high tribute Mr. Woodall had been good enough to pay to the work of German gas engineers. He (the President) must say they had that morning enjoyed themselves immensely, and had greatly appreciated all they had seen. What they had witnessed at the lunch, in the way

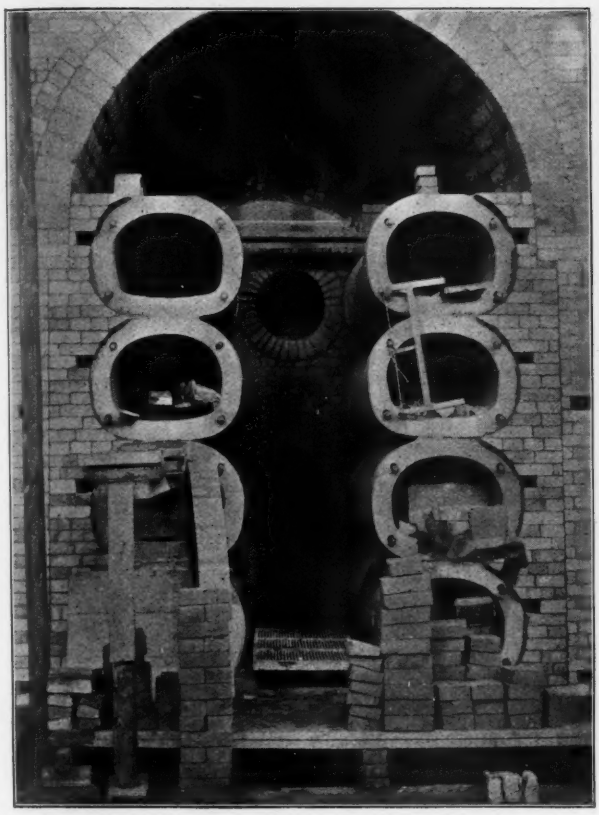


VIEW SHOWING THE LARGE EXTENT OF PIER ACCOMMODATION AT BECKTON.



ANOTHER GENERAL VIEW OF THE BECKTON WORKS.

of a beautiful generosity, exceeded anything that might be seen on the Beckton works. They had to go through these vast works not in the way usually adopted on such occasions. It had really been impossible for them to study anything, seeing that they had to go through the place in an express train in order to get any idea at all of the extent of



Construction of New Beds of Ten Retorts at the Beckton Works of the Gaslight and Coke Company.

the operations. At the conclusion of their inspection, they were impressed by the parade of locomotives and horses; and at that moment he should like to have called out "Woodall to the front." Mr. Woodall had jocularly referred, in conversation, to the German invasion that morning; and, seeing the German flags all over the works and on the piers, he (the President) might have been forgiven if he had thought the invasion had been completed. But he took it as a sign of co-operation between British and German engineers; and he asked and advised his countrymen and his British colleagues to pull together and work together to attain the great object of getting the best efficiency and the highest econony in the gas industry. An example of how this was to be done had been seen that very morning. In the Beckton works they saw how work on the largest scale ought to be done. The President concluded by calling for three "*hochs*" for the Governor and Directors of the Gaslight and Coke Company.

His request was heartily complied with.

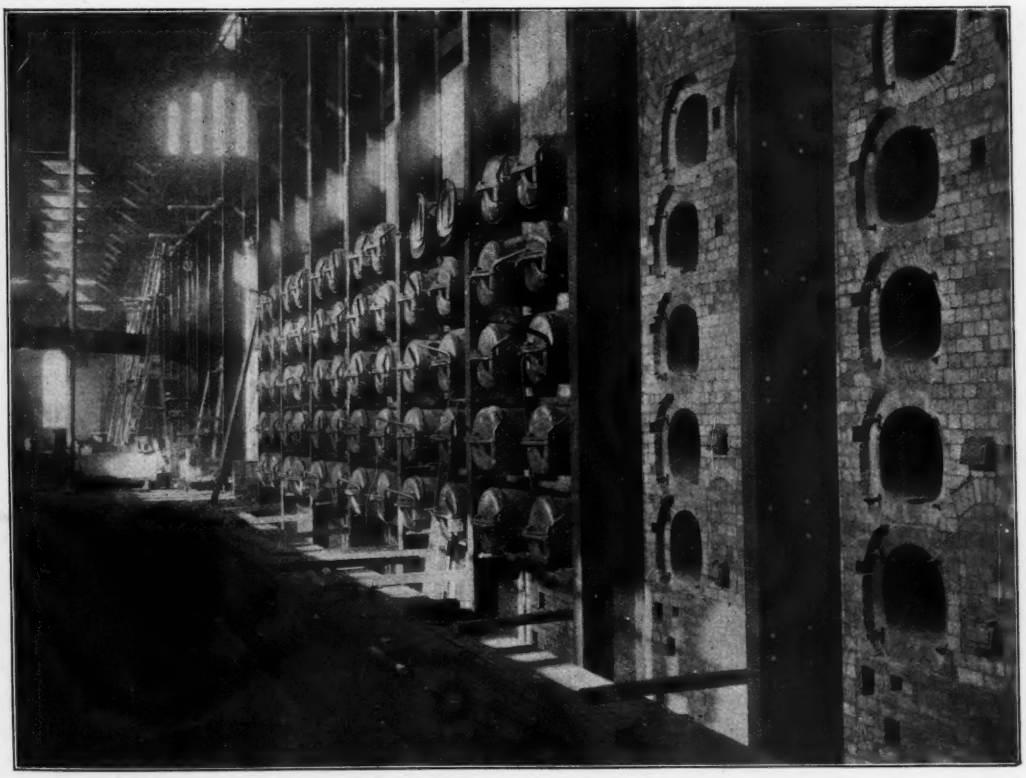
The GOVERNOR observed that their allotted time had now expired; and all he could do was to thank Herr Prenger for his kindly toast to those present who represented the Gaslight and Coke Company.

THE WOODALL-DUCKHAM SETTINGS AT KENSAL GREEN AND THE FIDDES ALDRIDGE MACHINE AT FULHAM.

The motor-cars were again requisitioned; and soon the visitors were flying over the roads from Beckton—the long procession of cars making quite a spectacle for the denizens of the East-end. This time the visitors were able to see by contrast the differences between the East and the West; for from out of the gloomy and drab conditions of the East-end, they were driven, passing *viâ* Euston Road, into the pleasanter conditions of the West-end. The Kensal Green station of the Gaslight and Coke Company was reached about three o'clock; and the greater part of the time there was spent inspecting, from ground-level to charging-floor, the Woodall-Duckham system of continuous retorts. This was probably the first time the majority of the visitors had seen the continuous vertical system in any shape or form, and therefore their interest was great—more especially coming as they did from the country of the birth of the Dessau intermittent system. Mr. C. A. Cunnold, the Works Engineer, was kept busy answering the many inquiries of the visitors—inquisitive and painstaking in obtaining information—from the charging-floor in the roof of the house down to the exit of the coke below. They were interested in seeing the attendant simply standing curiously watching the visitors as they strolled about the plant that he had in charge, while silently the charging mechanically continued above and silently the discharging continued below. It was learned that the following are the results of one of the latest tests of the plant, made from Aug. 12 to 18 with Aldwarke Main washed nuts:—

Total coal used	315 tons.
Total gas made	4,154,000 cubic feet.
Gas made per ton	13,187 ,, ,,
Candle power	15·35 English candles.
Calorific value	136 calories gross.
Dry coke and breeze sold per ton of coal carbonized	11·38 cwt. = 56·9 per cent.

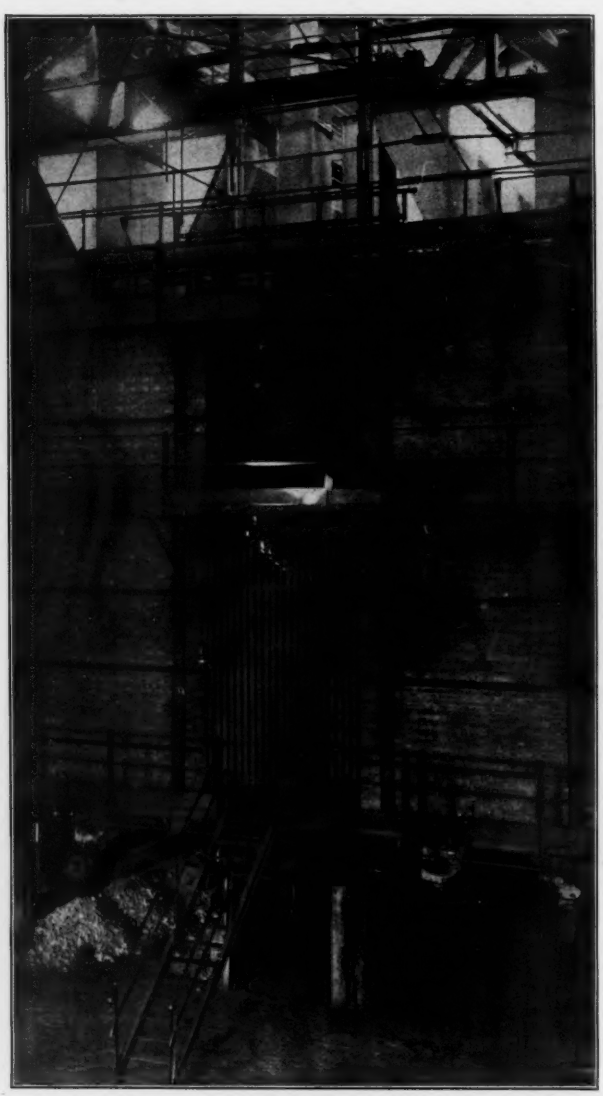
Hard by the installation were set out some specimens of one of the retorts; showing how, section by section, they taper outwards from top to bottom. There was not time to do more than make a hasty survey of other parts of the works; and then the visitors were soon again on the motor-cars, and whirling away to the



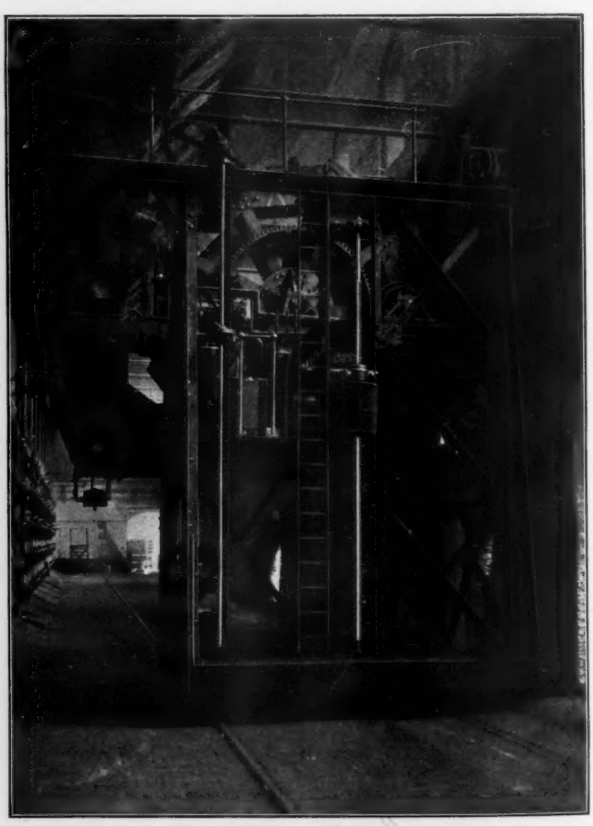
New Settings of Ten Retorts at the Beckton Works of the Gaslight and Coke Company.

A General View of the Kensal Green Works of the Gaslight and Coke Company.

Fulham station—the Governor and all the chief officers of the Company still in attendance on their guests. On arriving, it was found that another prominent worker in the gas industry had made time to run in and greet the visitors. This was Mr. H. E. Jones; and Mr. R. S. Gardiner, erstwhile Secretary of the Imperial Continental Gas Association, had taken the opportunity of coming to meet some of his old friends. At Fulham, the special feature of most interest to the visitors that Mr. J. W. Randell, the Engineer-in-Charge, had to show, was the Fiddes-Aldridge machine dealing with a house containing 22 settings of ten retorts. Mr. Goulden gave the information that the machine (which was putting in 10½ cwt. charges, with carbonizing going on for eight hours) was doing very cheap work. The visitors were highly interested in its operation, and moved from one side of the bench to the other and back again so as to see the simultaneous charging and discharging from both points of view.



End View of the Woodall-Duckham Settings at the Kensal Green Works of the Gaslight and Coke Company.



Fiddes-Aldridge Machine at the Fulham Works of the Gaslight and Coke Company.

Before the station was left, tea was served. Very soon afterwards the motor-cars were again boarded; and, well pleased with the day's outing, the visitors and their escorts of the Reception Committee arrived at the Westminster Palace Hotel just before half-past five. It was a laconic statement of fact that one of our friends was heard to make when he said "the whole thing

had been jolly well organized." There is a ring of sincerity about the remark; and certainly it was the truth.

INSTITUTION OF GAS ENGINEERS' BANQUET.

The Institution of Gas Engineers had in the evening their opportunity of entertaining their guests, and this they did in right regal manner, at the Hotel Cecil. The event was a big success. The President of the Institution (Mr. Alexander Wilson) was in the chair; and to the right and left of him sat respectively the President of the German Association (Herr Prenger) and the Vice-President (Herr F. Kordt). To the right-hand side of Herr Prenger were Mr. Corbet Woodall, Dr. O. Knublauch, Mr. J. A. F. Aspinall (President of the Institution of Mechanical Engineers), Mr. James W. Helps, Dr. Karl Bunte, Mr. H. E. Jones, Herr A. Müller, Mr. Thomas Goulden, Herr K. Pfudel, Mr. W. B. Smith (Sub-Convener of the Glasgow Corporation Gas Committee), and Mr. W. Doig Gibb. To the left-hand side of Herr Kordt sat Herr Hasse, Mr. W. T. Reid, Herr K. Heidenreich, Mr. Balfour Browne, K.C., Herr G. Möllers, Mr. Charles Hussey (Chairman of the Croydon Gas Company), Herr H. Zollikofer, Mr. H. Birchenough, Herr J. Elster, and Mr. W. R. Herring. The Reception Committee and several ordinary members of the Institution were present. The tables were beautifully decorated; and at the back of the President appeared in prominent characters the word "Wilkommen." The expressed sentiment was greatly appreciated by the visitors.

After dinner, toasts and music occupied the remainder of the evening. Most efficiently Dr. Lessing again acted as interpreter from German into English and *vice versâ*.

The CHAIRMAN, in proposing "The King," remarked that as the meeting between the British gas engineers and their German friends was due, at this particular time, to the dire calamity that befel this country in the lamented death of their late King, he need hardly refer to what all recognized, and that was the loss incurred by the whole British nation and the civilized world. But King George now claimed and had their homage; and they wished him long life and prosperity, and the health to maintain the best traditions of his race. They hoped he would be long spared to continue the good work so well taken up by his father, which had added so materially to the maintenance of the peace of the world.

Very heartily the toast was drunk, and equally so was the one next proposed by

The PRESIDENT, with the remark that, having toasted with loyal honours King George, he would now ask all present to accord the same honours to the Emperor of Germany. Closely allied to their own King by the ties of blood, he could call him in more than the ordinary sense "cousin." The Emperor represented, and held sway over, an immense dominion; and he ruled over a great people.

The PRESIDENT said that, in calling upon Mr. Helps for the next toast, he would ask those present to remember that, in the ordinary course of events, Mr. Helps would have sat in the chair which he (the President) occupied. It was right, therefore, that their friend should have the opportunity on this occasion of proposing the toast of "The German Association of Gas and Water Engineers."

Mr. HELPS said he must thank the President most sincerely for the courtesy and self-sacrifice that he had shown by asking him (Mr. Helps) to undertake this very pleasurable and important duty of proposing the toast of "The German Association of Gas and Water Engineers." He appreciated deeply the President's action in this matter. Might he also express the great regret with which the Council came to the conclusion that the proper course was, through the circumstances the President had mentioned, to postpone the visit of their German friends to England, to which they had all looked forward so long. Happily, the postponement, so far as he could judge, had not interfered with the success of the meeting. He was glad to see that so large a number of their German friends had been able to pay a visit to England. The Institution of Gas Engineers wished the number had been larger, and that it had included the names of others whom they would have been most glad to welcome there that day. Among British engineers, the names of some of the absentees were as household words. He alluded to Professor Bunte, Herr Körting, and others. To Professor Hans Bunte their congratulations were extended, upon the honour conferred upon him of being raised to the rank of a Privy Councillor. They were all met that day because they were interested in the same concerns; and their main object was the progress and benefit of the great gas industry, without envy, or without fear of competition among themselves. But, as citizens of Great Britain, they greeted their German friends, because they felt that they would like to have some opportunity of showing how very much they appreciated the great cordiality and kindness with which they had always received them when visiting Germany in the capacity of gas engineers. Whether they went as representatives of their own technical body or as deputations from their individual companies and corporations, they had always received the greatest hospitality and courtesy; and every facility had been given them to study, under the most pleasurable and favourable conditions, the works which had been the object of the visit to Germany. British gas engineers rejoiced to see their friends here, and to be in a position to personally and collectively tender their grateful thanks for what they had done in the past. The memories would ever live of the visits paid by the Institution to Berlin, when opportunities were afforded for seeing the emblems of the skill of the great engineers at Mariendorf, Tegel, and Oberspree. He thought he must ask those present to excuse him if he ventured to lay claim for a moment to a feeling of pride that this country was foremost in the development of the gas industry in Germany. When it was remembered that London was lighted by gas as early as 1807, that until 1826 illumination by means of oil was almost universal throughout Germany, and that it was the Imperial Continental Gas Association which built the first gas-works at Hanover in 1826, in which year the same Association obtained the concession for lighting Berlin, he thought his hearers would see that he was perfectly justified in entertaining the feeling of pride to which he had alluded. He was glad the first manager at Hanover was Herr L. Drory, the founder of a family whose name had been so long and so honourably associated with everything good in connection with the gas industry of Germany. Berlin was lighted by gas in 1826—the well-known avenue of the Unter den Linden being the first thoroughfare to be lighted; and it was so successful that the principal newspaper of the day referred to it in most glowing terms, remarking that the brilliant lighting of the streets made Berlin as great a pleasure to those who saw it by night as to those who saw it by day. Those who knew Berlin would concede that it was now the most brilliantly lighted city in Europe. He thought it would also be agreed that the remarks of the newspaper alluded to were as true now as ever they were; for in no town could one see such a lively and stirring sight as in the early hours of the morning. [Laughter.] With regard to the progress of the gas industry in Germany, it might be interesting to know that when the first works were built in Berlin—the Gitschinerstrasse works—the total make of gas in 1826 was only 2 million cubic feet; but in the past year 1650 million cubic feet were made at the works. When gas supply was first introduced through the whole length of the Friedrichstrasse—the principal business street of Berlin—a 6-inch main was considered amply sufficient; while to-day a 30-inch one was barely enough, and mains as large as 42 inches in diameter were not unknown in Berlin. England had had, as he had claimed, a great deal to do with the initiation of the gas industry in Berlin. Though it was true that Murdoch and Winsor were born in this country (some claimed that Winsor's name should be spelt with a "z," and that he was born in Germany), it was also true that for a considerable number of years the progress of the gas industry had been due to no small extent to the energy and thoroughness, and also the scientific ability, with which German gas engineers had faced the many difficulties which had presented themselves to engineers generally in the past. Though it was perhaps true that anyone wishing to know what was best in gas practice had to come to England, it was equally true that the student was rapidly outstripping his teacher, and that anyone wanting to know what was the latest and the best with regard to the progress of gas engineering, did not think he had done the correct thing unless he had paid a visit to Germany. And those who went always came back feeling they had learnt something which they must put into practice for the good of their works, and of the industry generally. All honour, then, to such men as Siemens, von Oechelhäuser, Körting, Drory, Schilling, Bueb, and others; and what could they say to add lustre to the name of Baron von Welsbach, without whose invention of the incandescent mantle improved and more economical processes of manufacture, such as the vertical retort, would have availed little in the efforts of gas managers to combat the fierce onslaughts of electricity to oust the gas industry from its position in lighting. They owed, too, a deep debt of gratitude to those who had attacked the great problems of carbonization in Germany. In this country, gas engineers had taken their share in continuous carbonization in vertical retorts; and they did feel that, though it was said that there was nothing new under the sun, and while the German scientists had done so much work in connection with this matter, the whole gas profession owed a debt of gratitude to England. He wished to repeat how delighted they were to see their visitors. They hoped they had all enjoyed themselves and their visit. All those present had but one object at heart, and it was to do all that was possible to further the interests of the great industry which they loved to serve; and, in addition, they wanted to do something in a small way, as engineers and scientists, to assist as far as possible in the maintenance of peace and good-will among the nations. He wished to couple with the toast the name of Herr Prenger, of Cologne, whose work in connection with vertical retorts was well known. They would like, too, to specially unite with the toast the name of Dr. Karl Bunte, the worthy son of a great sire.

Herr PRENGER (who was received with great applause) warmly thanked the Institution of Gas Engineers, in the name of the German Association of Gas and Water Engineers, for the invitation with which they had honoured them; and, further, he thanked Mr. Helps personally for the appreciative words he had addressed to him. The members accepted the kind invitation with pleasure, and with the conviction that they would be received with open arms and have a hearty welcome. They knew they were coming to the mother-country of the gas industry; but they had also come convinced that they would find not merely technical colleagues, but, if he might say so, dear friends, with whom they were working together. At the present day, things moved very rapidly; and in the gas industry especially development and progress had been so great that it was no longer possible for one person unaided to keep abreast of them. Then it became more than ever necessary to form associations for the purpose of meeting one another. Every day brought new discoveries. Mr. Helps had dealt in a charming manner with German work in this direction. He had shown himself to have a good knowledge of Berlin, and especially of Berlin at night—[laughter]—this, of course, referred only to his acquaintance with the public lighting of Berlin. The members of the Association were very pleased to meet their English colleagues in order to interchange views and experiences. He greatly desired and hoped that the visit would serve to further their common work; and he asked his colleagues to show their concurrence with him in this wish by hearty applause.

The German visitors cordially complied with Herr Prenger's wish.

Herr KORDT, in proposing "The Institution of Gas Engineers," thanked the Institution and especially its President (Mr. Wilson) for their kind invitation, which the German Association had accepted with pleasure. The visit would have taken place earlier if it had not been for the lamentable occurrence of the death of King Edward. He would express to all his sincere thanks. It would have been impossible for his colleagues and himself to have been received in a more friendly and charming manner. Sometimes, when they read the newspapers, they were apt to believe there was tension between the two countries; but an Englishman going to Germany or a German coming to England observed nothing of it. Such discord between the two peoples would never serve any useful purpose; it had never yet happened that they had waged war against each other. The visitors had come to England the more gladly because the English had been their instructors in the

gas industry; and they still came to learn. It was due to the energy of the English Gas Associations that the consumption of gas here had attained such great proportions; and the visitors must take for their example the energy of English gas engineers in promoting the use of gas. Gas must not be regarded as a privilege accorded to the wealthy and middle classes, but as something to which the poor, and even the very poorest, were entitled. There was no envious opposition in their work, but a friendly rivalry prevailed everywhere. Therefore he asked his colleagues to join with him in drinking the toast of "The Institution of Gas Engineers and its President, Mr. Wilson," with a "*Hoch!*" "*Hoch!*" "*Hoch!*"

The PRESIDENT: In reply to the toast so eloquently proposed and so heartily responded to, allow me first to add my words of welcome to those of Mr. Helps. I have had the pleasure on two occasions of visiting Germany; and the memories of the visits are very pleasant indeed. The attention with which our party was received, and the readiness to show us all the splendid plants in the various works visited, left us with a deep feeling of indebtedness. In addition, the extreme kindness of all those whom we met made me personally feel that, though a Scotsman, I had still much to learn of real hospitality and the true methods of entertaining strangers. Herr Kordt has referred to tension that is supposed to exist between Britain and Germany, and, on the part of the business and general community of his country, disclaims any idea of complications that might arise, and derides the idea of two such civilized and enlightened peoples, with many ties of old-time friendship between them, coming into conflict. We can assure Herr Kordt and his friends here that we equally deplore every act and every utterance which tends in any way to cause friction between our nations. We hold with him in the wish that each country will prosper in its own way, and that the two countries and their people will long continue on the terms of the warmest friendship and amity. Herr Kordt further said that the only rivalry that now exists between the gas engineers of Germany and Britain is a friendly one, as to which nation will do most, by invention and research, to improve the *technique* of gas engineering and manufacture. With him, we would do honour to the many great engineers and chemists of both countries who have assisted, in their day and generation, in improving our systems of working, and in bringing new methods and appliances into use. There need be no envy between us in this good work; and we give the fullest credit and honour to the gas engineers and chemists in Germany for the great work they have done in recent years in connection with the problems of gas manufacture and purification. There is one matter that I would like to touch upon before I sit down, and that is the great part the gas industry is likely to play in the crusade against the smoke evil. The governing bodies of our large towns and cities are beginning to realize the danger to public health and the immense loss caused to every community by the present barbarous methods of using raw coal for heating purposes. The work of the Smoke Abatement League, though earnest and beginning to bear fruit, has been very much like a voice crying in the wilderness of smoky chimneys. We view with pleasure and hope the increasing interest which is being taken in this great and important question by the municipalities of our large cities. In Glasgow at the present time the Corporation, who have only just completed a large and costly sewage scheme for the purification of the River Clyde, are taking up the purification of the air in a practical and business-like way. They are being nobly assisted by the Press in arousing interest in this difficult problem. We have every hope that, as they have succeeded in so many other directions, they will also carry this scheme through to a successful issue, and obtain for the citizens of St. Mungo their proper share of sunshine and pure air, with all their attendant blessings. As the purveyors of gas, which is at the present time the only really efficient and economical substitute for coal for domestic use, we must do all we can to help forward the good cause. We must, in addition to doing all in our power in the way of producing the most suitable gas at the lowest possible cost, take up the work of educating the public in the proper and beneficial uses of gas; and we are waiting with interest the proposals of the Publicity Committee of the Institution of Gas Engineers as to how this educative work is to be best carried on. If the Institution, the gas companies, and the corporations of our large towns will unite in a friendly and effective way in this great crusade, we can look forward with hope to the time when the smoke and fog fiends will cease to trouble and devastate our cities and towns. I beg to thank you, Herr Kordt, for the kind and eloquent manner in which you have proposed this toast, and you, gentlemen, for the hearty way in which you have received it.

Mr. CORBET WOODALL proposed the final toast—"Kindred Associations." In the course of his remarks, he said that science was world-wide, and knew no geographical boundaries; but the societies for the promotion and advancement in knowledge of science had a local habitation. No scientific society could, however, stand alone—such societies were formed by men of like pursuits or inclinations who joined together to increase their knowledge and advance their usefulness and value. But when their particular science came to be applied, it was seen how immediately they were brought into contact with other branches of science not clearly within the range of their own society. Hence the same men were members of many societies. For instance, he might take their own industry. The Institution of Gas Engineers properly represented the gas industry in this country, and the science pertaining to that industry; and it spoke with authority in regard to gas questions in England. But when the members, as gas engineers, came to apply their science, they found that they had to erect great buildings, construct composite works, and build railways and bridges. Under these circumstances, they felt they had some claim to be included in the membership of the Institution of Civil Engineers; and many of them were members of that body. Those present had been visiting a London gas-works that morning, and they had seen considerable works designed by different people (largely by his friend Mr. Goulden); and they had at the end a parade of some thirty locomotives. They also saw a great number of engines and pumps, and so forth; and the designing and construction of these would lead Mr. Aspinall to say that those who designed such works were entitled to be members of the Institution of Mechanical Engineers. They saw, too, the chemical factory, employing some 400 or 500 men, in which there were made (he was afraid to say how many different) products, the results of the distillation of coal. This was purely a chemical industry; and naturally the association between their industry and that of the chemical societies was very close. Therefore they were obliged to take their share in the work of the chemical societies, and look on what was being done at home and abroad with regard to that branch of science. So they might go the whole round. They had to sink wells in order to obtain water for the supply of their works; but they had to consult the geologists with regard to operations of that kind. Therefore he said that while science knew no bounds, societies did. One advantage accruing from this fact was that they had kindred societies in different countries of the world; and with these they had, he was glad to say, an ever-increasing sense of brotherhood. They had that evening with them their brethren from Germany; some time ago they had a similar visit from their brethren from France. One of the advantages attaching to these kindred societies in different countries was that they enabled them to unite as one for the promotion of the industries with which they were respectively associated. He coupled with the toast the name of the President of the Institution of Mechanical Engineers, Mr. Aspinall.

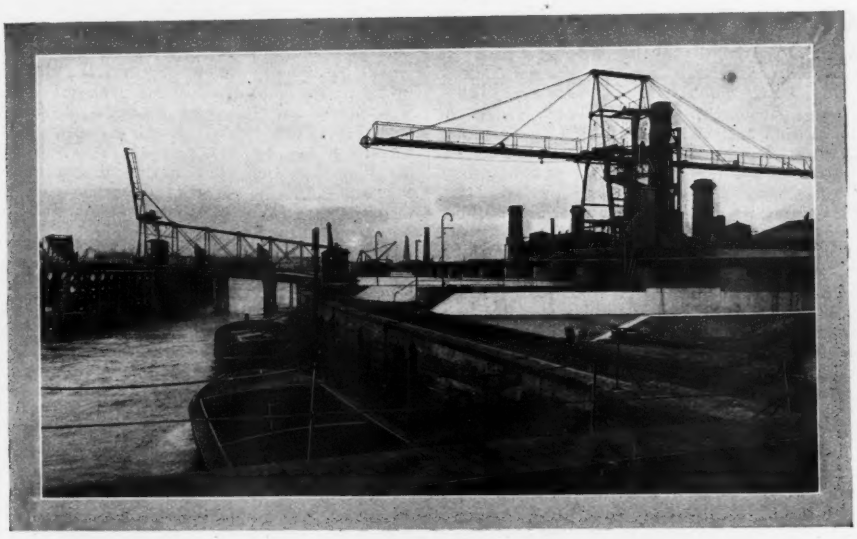
Mr. ASPINALL, in the course of his reply, remarked that it was perfectly true, as Mr. Woodall had said, that no scientific society could stand alone. He ventured to think that probably Mr. Woodall would agree that the Chemical Society, the Institution of Mechanical Engineers, and the Institution of Electrical Engineers had been the greatest of helpers to the Institution of Gas Engineers. It might possibly seem an anomaly that the Institution of Electrical Engineers was a great help to the Institution of Gas Engineers. But surely it was that healthy competition in the supply of light that first started those great efforts to improve the gas industry which had resulted in the growth of the demand by the public for the best possible illumination. When they came to look at the mechanical side of the question, there was hardly a thing, as Mr. Woodall had pointed out, in the way of machinery which was not, in some way or another, associated with the gas engineer; and when they came to see the use which was made nowadays of gas-engines, it illustrated in a forcible way that combination between the two societies was necessary for mechanical progress. The gas-engine was in large measure due to a German; but it had now reached a stage which was far beyond what he anticipated. It had, however, to go much further before it could compete with the large powers of the steam-engine. That these powers would be reached, no one could doubt; but at present they seemed to be a long way off. On the other hand, while there were difficulties with the large powers with the reciprocating gas-engine, it was only recently that Mr. Humphreys introduced to them what had become known as the Humphrey pump; and in this he (Mr. Aspinall) thought they had the triumph of the gas engineer. He supposed some genius would next spring up, and show the way to get rid of the difficulties encountered with gas-engines of large power. But he would no doubt have to pass through a great deal of hard work before he perfected the large-power gas-engine. This reminded him of something that was said by Professor Schwartz, of Manchester, the other day, when talking to some of his students. He said that one must not expect everybody to be a genius, and that the fact of the matter was that the best work of the world had been done perhaps in the proportion of 10 per cent. by inspiration and 90 per cent. by perspiration. [Laughter.]

The PRESIDENT, before the proceedings concluded, called attention to a *souvenir* prepared in a very tasteful and artistic manner by Mr. F. D. Marshall. He said that Mr. Marshall had given them something which all would treasure and keep as a memento of the visit. They desired to express their thanks to him. They must also specially thank Dr. Lessing, who had done so much to add to the enjoyment of the evening by his interpretations of the speeches.

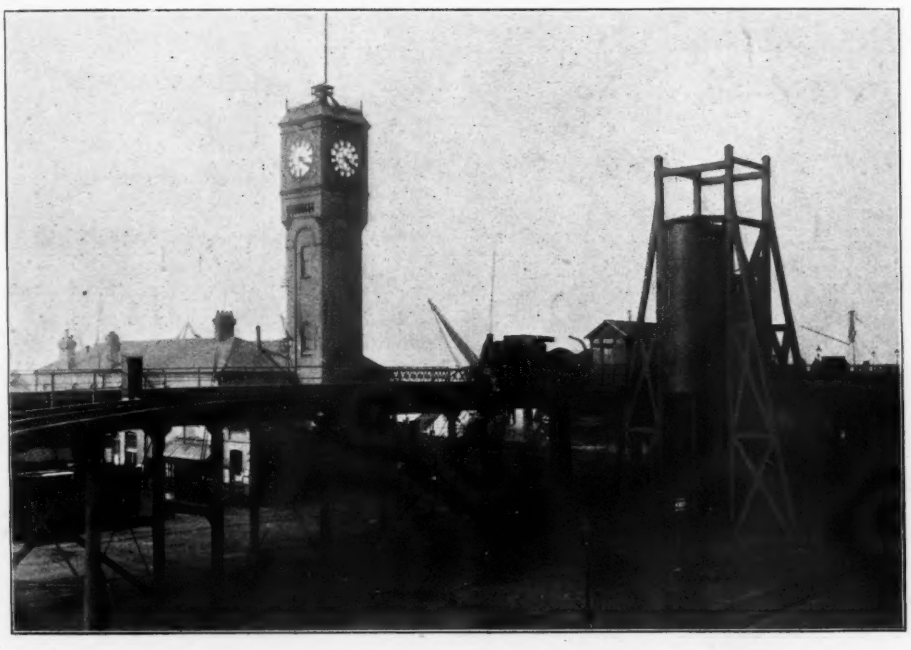
"God Save the King" and the "Watch on the Rhine" brought to a close a most happy evening.

AT THE EAST GREENWICH GAS-WORKS.

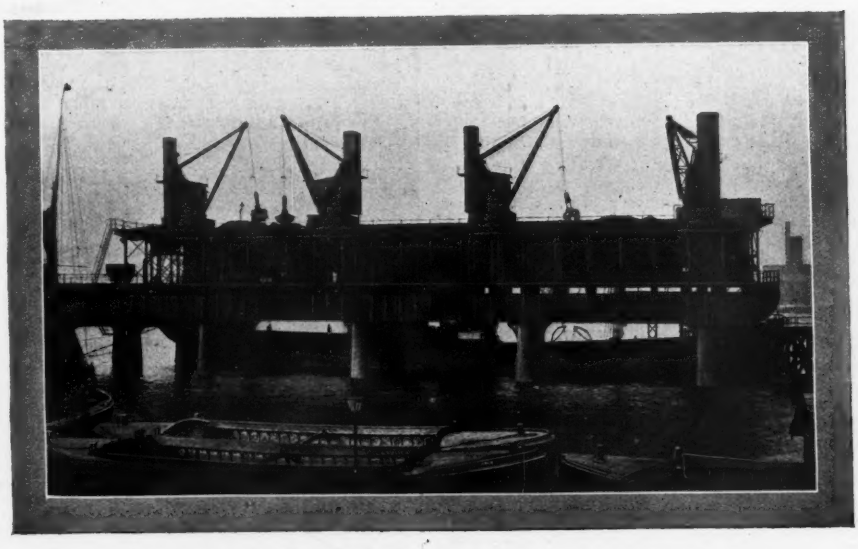
On Tuesday morning the weather was again all that could be desired; and though a full day had been passed through on Monday, the whole of the visitors were fresh and ready to undertake the day's programme without delay from the appointed time. Let us say here that (apart from the splendid arrangements in every detail made by the Reception Committee and by Mr. Dunn, the visitors themselves, by their eagerness not to transgress time arrangements in any way, contributed much throughout the week towards enabling everything to "go like clockwork." Discipline and punctuality are exemplary traits of our German friends; and they admire it in others. That by the way, however. The great works at East Greenwich of the South Metropolitan Gas Company and those of the Croydon Gas Company were to engage respectively Tuesday morning and afternoon. This time the journey from the Westminster Palace Hotel took us across the river *viâ* Westminster Bridge; and the visitors were able to see something of the southern side of London, but not the best neighbourhoods. A little detour would have wasted time, all of which that was available was required to view the great works that are under the care of Mr. Tysoe. As the works were approached, that great monument to the engineering courage, conception, and skill of Sir George Livesey—fit memorial to a large heart and energetic and fertile brain—the 12 million cubic feet capacity holder, came into sight, with lifts fully inflated, the top ones rising above the standards. The holder that took precedence of all holders for magnitude until lately, and now stands second largest in the world, riveted the eyes of the German visitors. Some marvelled, others admired; all realized they were in front of the work of a leader among men. We had first to inspect the tar and chemical works of the Company; and at the entrance gate the cars pulled up. There stood Mr. Charles Carpenter, Sir George's successor in the chair of the Company, waiting to receive the members individually. Also representing the Board, were Mr. Frank Bush, Mr. John Ewart, and the Employee Directors—Mr. Henry Austin (about



The Temperley Transporters for the Loading of Barges from the Pitch Beds at the East Greenwich Works of the South Metropolitan Gas Company.



A View in the East Greenwich Works of the South Metropolitan Gas Company.

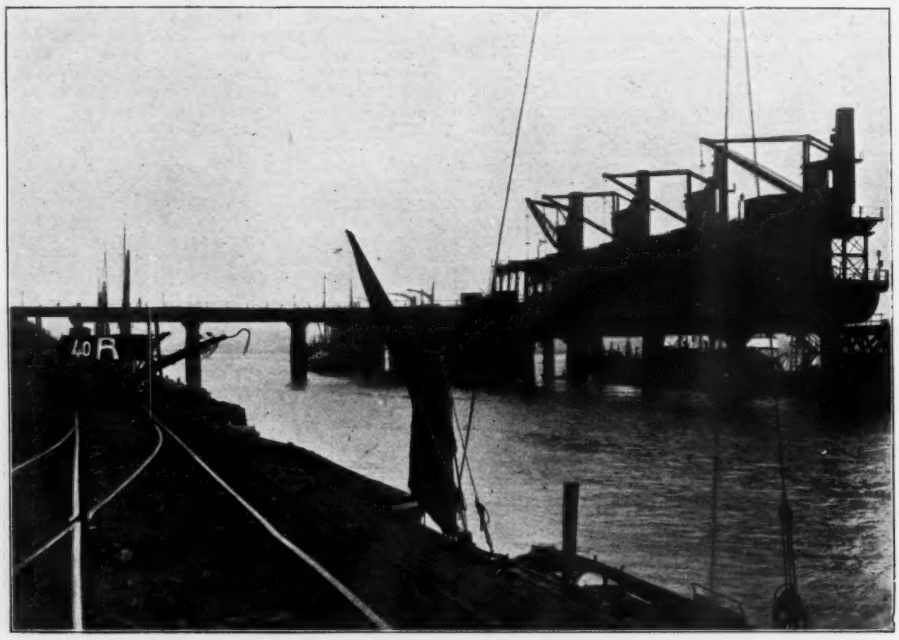


Coal-Unloading Pier at the East Greenwich Works of the South Metropolitan Gas Company.

to retire), Mr. W. H. Cupit, and Mr. James D. C. Hunter. The Chief Engineer (Mr. W. Doig Gibb) was there, as was also the Secretary (Mr. F. M'Leod). All the station engineers (in addition to Mr. Tysoe, whom we were glad to see in improved health), were present: Mr. A. F. Browne, Mr. J. F. Braidwood, Mr. W. D. Hunter, Mr. T. S. F. Gibson, and Mr. C. Franks. The visitors had been presented with a leather-bound book, with gilt-edged leaves, printed in German, splendidly illustrated, and containing a special plan, describing, with excellent care and in detail, the Company's undertaking and its East Greenwich works. The book will be preserved as a memento of the visit. In all directions, every particular in the arrangements for the visit had been thoroughly studied, so that nothing should be wanting to ensure success. The organization was described as magnificent by one German friend; and it was. One little point in illustration. A handy card in German or English as required was handed to every one of the party. This had the complete route to be followed figured upon it, and the name of the plant against the figure; and large corresponding figures met the eye, by simply following the arrows plentifully placed about the works.

The company were soon under the charge of Mr. S. S. Field, the Manager of the Ordnance Wharf Tar-Works. This is work that the German visitors are able to specially appreciate; and Mr. Field patiently went several times step by step over the operations and processes followed in their tar distillation for the edification of the inquiring visitors. There was much admiration expressed for the compactness, cleanliness, and general condition of all the plant; and Mr. Field must have been proud of the commendation of such competent critics. They were also much taken with the oil-burning under the boilers. Interest was not easily exhausted at this early stage; but there was time to be considered, and so a move was made to the pitch bays at the side of the river, from which, by a Temperley transporter, the pitch is loaded into barges in the river. The working was greatly admired. We will not go into any detail here over the plant, as it is described in outline elsewhere. But there were still other parts of the tar-works to be seen; and the visitors, as they passed along, inspected in order an oil-still, another tar-still, the tar storage-wells, the laboratory, creosote plant, benzol still, and anthracene plant. They left the Ordnance Tar-Works fully impressed with the excellent practices under which they are conducted.

A short spin by motor-cars brought the party to the East Greenwich Gas-Works; and the cars, by the way, were very useful later in getting from one part of the works to the other. The great gasholders again came in for attention; and mental calculations were being made by some of the engineers of the smaller German works as to how long the contents of the 12 million cubic feet structure would enable them to meet their needs at the present time. With them the work was "fine"—a favourite expression, and frequently heard during the week. The blowers used in the interests of proper and sufficient distribution were next inspected; and it was observed that these are being shifted under cover outside the house in which they have for a long time found habitation, and extensions are also being made. From here the coal jetty was visited; and the excellent river frontage of the works was seen. Mr. Carpenter had so arranged matters that there should be demonstration at every stage; and here it was seen how the coal was raised by crane and grab, and then sent away along the high-level railway from which branches sweep into all the retort-houses. From this point the route mapped out took



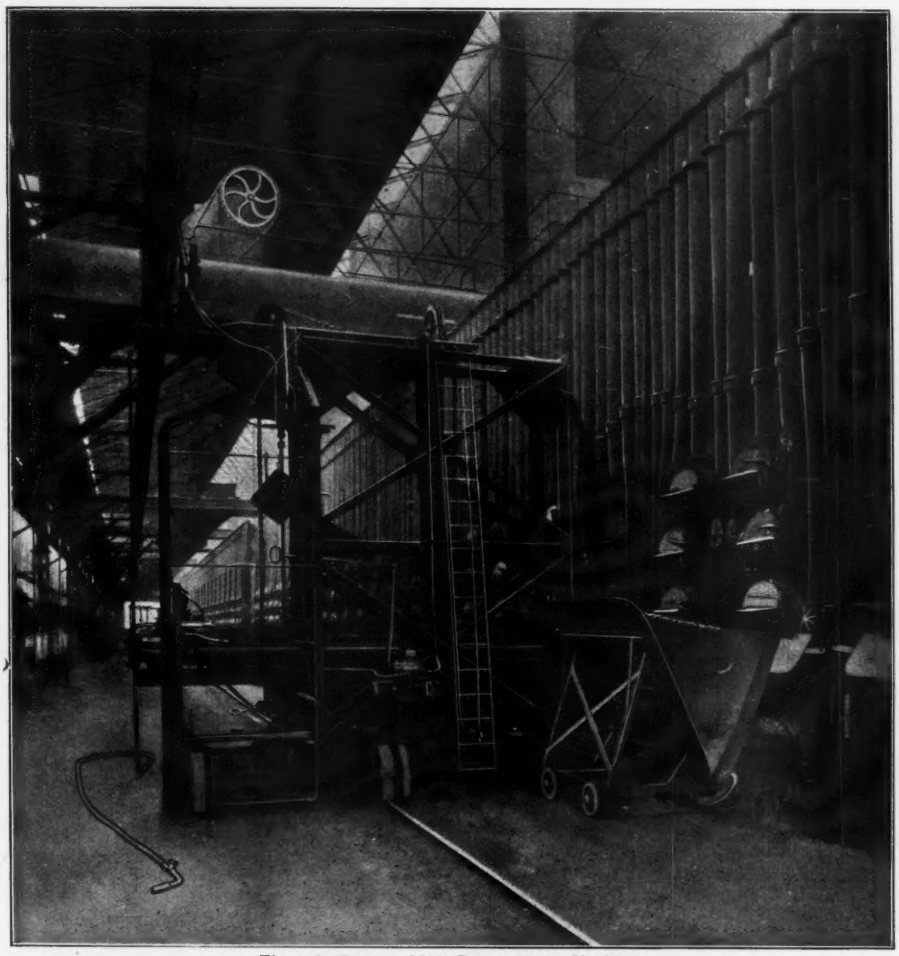
A View Riverwards from the East Greenwich Works of the South Metropolitan Gas Company.

the visitors through the exhauster-house to the hydraulic pumping-engines and to the stores for purifying material. Here it was remarked that the Company have returned partly to lime purification. They have no carburetted water-gas plant; so that coal gas only is distributed. Under the circumstances, it has been thought desirable to supplement in a measure oxide purification. Mr. Carpenter intimated this at the last half-yearly meeting of the proprietors, when he said: "Turning now to our working expenses, purification is some £4000 higher. We are working to a higher standard of purity, and have increased our expenditure both in experimental plant and in purifying materials. . . . Large quantities of gas are used for heating and power purposes, where a high degree of purity is of little or no moment. On the other hand, about one-half is used for the illumination of dwellings and workshops, &c.; and it is important that regard should be had to this in determining our standard." The underground station meters were looked at with much interest; and one German visitor remarked to the writer: "There is not much luxury about these works; but it is all very fine and practical." The extensive and well-equipped workshops caused the visitors to linger somewhat examining the machinery and the large variety of work that was proceeding. They were especially interested in a planing-machine which Mr. Austin (who has for so long been foreman carpenter) demonstrated dealt with four sides of a plank of wood at the same time. No. 3 retort-house was the one selected for showing the high character of carbonization work done here; and the changes that have been wrought by heavy-charge working were explained. The sulphuric acid plant on these works is something that no one should miss; and no one did miss it on this occasion. Naturally, from there the sulphate of ammonia plant was inspected.

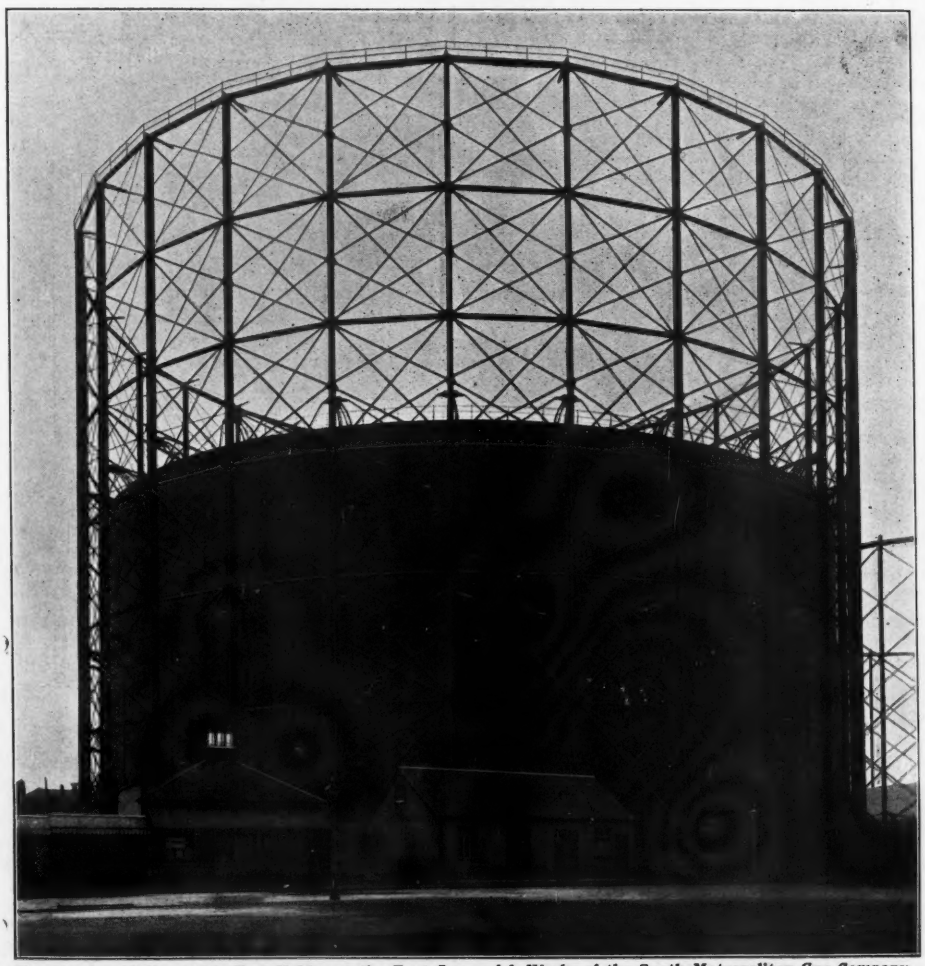
By this time the numerous company was hungry; and with little delay over necessary ablutions, the luncheon-room was entered. This room was a marvellous transformation of a yet unused sulphate store into a picture of magnificence in the way of a banqueting hall. It was obviously the work of a genius. Tapestry covered the wall. Shields were there bearing the coats of arms of the principal cities of the German Empire. The flags of the two nations were entwined here and there. The oil painting of Sir George Livesey that has hung in the Board-room at Old Kent Road since the strike was suspended behind the Chairman's position at the head of the table. Overhead a gauzy material blocked out the fact that a sulphate conveyor was interposed between it and the glass roof of the building. The subdued light added richness to the scene. Palms and rich floral decorations abounded. This could all be taken in at a glance. The lunch was worthy of the occasion. Mr. Carpenter delighted the Company's guests as Chairman; for nothing had been left undone to give them pleasure. Grace was said by the Chairman; and, rising from the neighbourhood of the palms at the opposite end of the hall, came from a quartette party a beautiful rendering of "For these and all Thy mercies, Lord." Seated, it was observed that among the guests were Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, the Chief Engineer (Mr. Thomas Goulden), the Secretary (Mr. H. Rayner), and Mr. F. W. Goodenough, the Controller of the Gas Sales Department.

After lunch,

The CHAIRMAN, in proposing the first toast, said: On occasions like the present, it is customary in Great Britain to drink to the health of the King. As this, however, is a gathering of representatives of an industry of two nations, I propose to modify the toast, and ask you



The "Co-Partnership" Retort House Machine.



The Twelve Million Cubic Feet Holder at the East Greenwich Works of the South Metropolitan Gas Company.

to drink to the health of the Sovereigns of both. Both nations are fortunate in having at their head practical monarchs. King George's most remarkable pronouncement was "Wake up, England," and it is well known that the Emperor Wilhelm's utterances have often caused Germany to keep awake. The two monarchs are related by blood, and both take the liveliest interest in the navies which watch the shores of their countries. May the sea always be large enough to hold both navies! and may their ships always meet in as friendly a manner as we meet to-day! Gentlemen, I raise my glass and ask you to drink to the health and long life of the two monarchs—Wilhelm II., German Emperor, and King of Prussia; and George V., King of Great Britain, and Ireland, and of the British Possessions beyond the Seas. "*Hoch! hoch! hoch!*"

The toast of the two Kings was enthusiastically drunk.

To the Memory of Sir George Livesey.

The Chairman: It is a remarkable coincidence that the day which has been chosen for you to honour us with your visit is the anniversary of the death of Sir George Livesey, who exactly two years ago passed into what Shakespeare called

> The undiscover'd country, from whose bourn
> No traveller returns.

Sir George was a great man; and as I know that my British friends would not let this occasion pass without honouring him, I ask you to join with us in rising from your seats, and drinking in silence to his memory.

The request was at once complied with; the large company standing silent for two or three minutes.

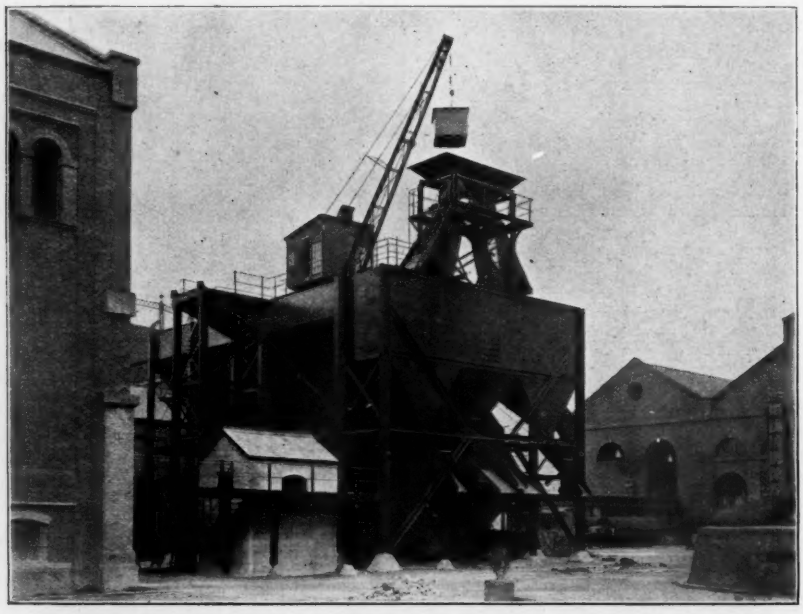
The Chairman said there was one other toast that he had now the honour to rise and propose. It was: "The Success and Prosperity of the German Association of Gas and Water Engineers;" and with that toast he desired to couple the name of Herr Direktor Prenger. Proceeding, he said: In proposing it, I must ask for your indulgence in my presuming to venture to address you in the German language. But I am filled with such great admiration for the qualities which have built up the Germany of the present day, that I am expressing myself in your tongue, although I have had to avail myself of friendly assistance in order to do so. I am forced also to discharge a debt of gratitude in expressing my thanks for the never-failing courtesy which has been extended to me whenever I have visited Germany and your gas-works. I have always, as an engineer, felt the greatest admiration for them; while as an administrator I have often envied your performances. I am not unmindful also how much we in Great Britain are indebted to the work of your inventors in the domain of gas manufacture—from Siemens right down to Bueb and Ries—and again to the wonderful manner in which you brought the invention of Dr. Auer into practical form, and made it accessible to the poorest users of gas. I have never met a British engineer who has not been of opinion that a visit to Germany was not of the highest service to him. So far as I myself am concerned, I only regret that I have not been able to go there more often and to stay longer. I am very sorry that Professor Dr. Bunte has not been able to be present with us to-day, as, after your President, there is no member of your Association whom I should have welcomed with greater pleasure. In asking you to drink with me to the prosperity and success of the Association of German Gas and Water Engineers, permit me to couple with the toast the name of Herr Prenger, the most worthy Manager of the Corporation Works for Light, Heat, Power, and Water Supply of the renowned City of Cologne, whose gas-works I have had the pleasure of inspecting. Let us also include in this toast, although it can only be done "*in absentia*," the health of our friend Professor Dr. Bunte.

Herr Prenger, in response, said they had come to the works of the South Metropolitan Gas Company that morning with much expectation. They had all felt a great wish to see the works of Sir George Livesey, who was not only the greatest of gas engineers, but he was a great social reformer. He had done much for the improvement of the conditions of those employed by this Company and others; but he had done much for the advantage of the poor through his encouragement of the penny-in-the-slot meter. Co-partnership was his own great work; and it had done much for many gas-workers in this country. He was sorry that the conditions of gas supply in Germany were such that the scheme could not be adopted in the same manner. But his memory remained with them; and next day he—in the name of the German Association—desired to lay a wreath upon his grave. They saw from the book that the Chairman had kindly presented to each visitor that the amount of the investment of the employees of the Company through co-partnership now amounted to somewhere about 10 million marks. That was a sum that spoke for itself; and it did not need many words to emphasize it. Though Sir George Livesey was not living in flesh, his work would live for all time. He had a worthy successor in their Chairman, Mr. Charles Carpenter. For the way he had received them in his fine works, for his kindly and courteous manner, and for the great hospitality they must thank him, and through him the Company. He (the speaker) desired therefore to propose the toast of "The Chairman and Directors of the South Metropolitan Gas Company."

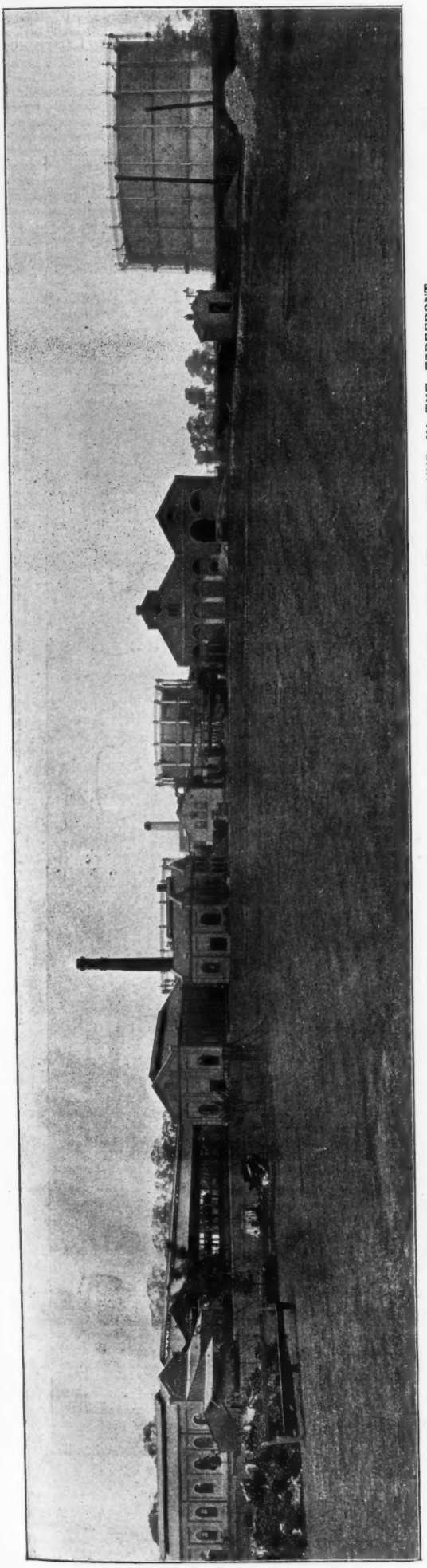
Mr. Carpenter said: In the name of my colleagues on the Board of the South Metropolitan Gas Company, I express to you our heartiest thanks for the manner in which you have proposed and drunk our health. It has been a very great pleasure to us to see you here to-day; and your visit will remain memorable to ourselves, as well as in the annals of our undertaking. I hope you will allow me also to express the great gratification I feel that so many officers of the Gaslight and Coke Company have been able to attend this function to-day. Many years ago I had the run of the works of the Gaslight and Coke Company. Those were happy days; and I am always pleased to acknowledge that I learned a great deal from the opportunities I had years ago when at Vauxhall. This gathering, and the fact that we are meeting in the way we are now doing, are unique, or nearly so, in the annals of the South Metropolitan Gas Company. I am sure that nothing would have pleased our late Chairman more than to have seen you here to-day, and to have welcomed you to these works. I thank you most heartily for the manner in which you have drunk our healths.

AT THE CROYDON GAS-WORKS.

Leaving the luncheon room, the guests made their way to the main road through the works, where the motor cars were assembled. Here good-bye was said to Chairman and officers. Groups of co-partner workers off duty were standing about; and as the cars left, these aided Chairman and officers in giving a ringing cheer of farewell. Outside the works, the cars were headed for the Croydon Gas-Works; and the route taken was through some of those further south-eastern suburbs that have a matchless picturesqueness so near London. When the Croydon gas-supply district was reached, it was found that Mr. Helps—good organizer that he is—had thoughtfully had posted at the corners of the roads where the cars were to turn men with small flags to direct the drivers. We were soon on the road to Waddon, and then not long in reaching the main entrance gates to the works that have had, during the last few years, their original character and conditions completely effaced by the large extensions and conversions carried out by the Engineer (Mr. Helps). At the entrance gates there were assembled the genial Chairman of the Company (Mr. Charles Hussey), Mr. Samuel Spencer, Mr. Percy Hall, Mr. W. J. Russell (Directors) to welcome the visitors. The other Directors—Mr. Corbet Woodall, Mr. William Cash, and Mr. T. Rigby (Deputy-Chairman)—had engagements which prevented them being present. Mr. W. W. Topley (Secretary), and Mr. A. Caddick (Mr. Helps' chief engineering assistant), and many other members of the staff were there prepared to guide and render information. The visitors were divided into groups, and taken round the works.



Coke-Sorting Plant at the Croydon Gas Company's Works (Marcus Screen, &c.).



A GENERAL VIEW OF THE CROYDON GAS COMPANY'S WORKS, WITH THE LARGE RECREATION GROUND IN THE FOREFRONT.

The banks of luxuriant flowers bordering the road from the main entrance delighted them; as did every part of the works, the size of which came better than that of the more extensive London works within the comprehension of the greater number. They wandered through the retort-houses, and witnessed the machinery at work; and in the last house to be converted, they saw how a pair of West's machines had been converted, at comparatively small expense, so as to be capable of dealing with almost full charges. The coke plant was examined with keen interest; but from among it all the new Marcus coke screen, conveyor, and loading plant was singled out for the greatest attention. The water-gas plant, Marsh's rotary meters, Colman's cyclone, the process for dealing with naphthalene, the condensing and washing plant in one house in the new section, and the magnificent purifying-plant all came in for notice and admiration. Lastly, the men's recreation ground was visited—the finest attached to a gas-works, we should imagine, in the South of England—and this appealed very strongly to the German visitors. Co-partnership and such provision as this are regarded by them as being of the best of influences against the socialistic tendencies of the times.

On this recreation ground photographs of the group of visitors and their hosts were taken; and then a walk through the works brought us to the large stove-shops and stores, one of which had been cleared and decorated, and made into an excellent tea-room. The German and British flags were conspicuous companions. One German visitor remarked that their British gas friends must have "spent much" on German flags; but it was a delicate token of amity, which was highly appreciated. After tea, there was a little speech-making.

Mr. CHARLES HUSSEY said it was his proud privilege, as Chairman of the Croydon Gas Company, on behalf of his brother Directors and himself, to bid their guests a very hearty welcome to the works. He could assure all present that it had given them the greatest pleasure; and he hoped the works they had passed through during the afternoon (although, of course, they did not expect they would compare in any sense with the works their visitors had seen during their short stay in this country) had been interesting to them. At any rate, on behalf of their Engineer (Mr. J. W. Helps) he wished to say that it had been a great pleasure indeed to him to show their German friends round the works. Croydon (like many towns he expected in Germany) had not always been the size it was now. It had small beginnings, and had gradually crept up until at present the population of the town was about 164,000; and to this figure it had grown within his own knowledge from 44,000. With this growth they had been able to keep pace in the manufacture of gas, and in the supply of the burgesses. He would like to couple with the toast of "Prosperity to the German Association," the name of Herr Prenger and Dr. Karl Bunte. It was also a great pleasure to have with them Mr. Alexander Wilson, the President of the Institution of Gas Engineers, many of the members of which paid them a visit in the summer. The Directors liked to receive their technical friends there, because they were proud of the works, and proud of their Engineer. (Applause.) Mr. Helps had been with them for nearly 27 years; and he (the Chairman) hoped it would be as long again before he left them.

Herr PRENGER, in reply, said their heartiest thanks were due to the Chairman for the kind words he had used. He could assure their hosts that it had been a great pleasure to them to visit the very fine, clean, and well-appointed works of the Croydon Gas Company. The day before they had visited the Beckton Gas-Works, which were only visible to them by express train. This [Tuesday] morning they had visited the East Greenwich Gas-Works of the South Metropolitan Company, which were only visible to them by the use of motor-cars. [Laughter.] They had that afternoon been able to see on foot the excellently planned buildings and plant in all their details of the Croydon Company. They had noticed at the entrance to the works how beautiful flowers could be grown in a gas-works; and they had seen in the machines, and in every other direction, how even a gas-works could be kept clean. Mr. Helps had been most modest in showing them his works; but all his friends from Germany could subscribe to the statement of the Chairman that the works were such that they were justified in being proud of them, and of the Engineer who had built them. They thanked the Chairman and Directors of the Company; and they drank to the health of Mr. Helps.

Mr. HELPS, in acknowledgment, said that he was proud to have the opportunity of seeing so many of his German friends there that day. With regard to the works, he thought the visitors would agree with him that they were moulded to a certain extent on the lines of some of the works on the Continent. He had paid many visits to the Continent, and especially to Germany; and he had always returned with some ideas which he hoped he had managed to convey to the works which had been erected at the command of his Directors. He thanked Herr Prenger most heartily for his kindly remarks.

Shortly afterwards, we were all again aboard the cars, waving adieus to hosts, and then tearing over the roads through Mitcham to the main road to London, proceeding *viâ* Streatham and Brixton. Westminster Palace Hotel was reached before 6.30; and that evening and next day were free to the visitors to engage their time as best suited them and their inclinations. Some visited places of entertainment on Tuesday evening, but not a small proportion took the opportunity of inspecting the newest forms of gas lighting in London streets. During Wednesday, too, many were diligently inquiring in various quarters respecting commercial gas matters in London—several finding their way to the Horseferry Road offices of the Gaslight and Coke Company, to obtain information from the Controller of Gas Sales (Mr. F. W. Goodenough). As mentioned elsewhere, too, Herr Prenger, with Herr Kordt (accompanied by Mr. Alexander Wilson and Mr. S. Y. Shoubridge) visited the grave of Sir George Livesey, and placed a wreath upon it in the name of the German Association.

TO SCOTLAND.

Platform No. 14 at Euston Station of the London and North-Western Railway presented a busy scene from eleven o'clock on Wednesday night for the space of about forty minutes. A special train composed of sleeping cars had been engaged to transfer the visitors from London to Scotland during the night; first visiting Edinburgh and then Glasgow—the city which absorbs the professional activities of Mr. Wilson The party numbered ninety; and dealing with the luggage of, and the handing of tickets to, such a number, was not a small matter. But the compartments had previously been allotted, tickets for the whole journey enveloped and named, and luggage labels provided by Mr. Dunn; so that everything went off with mechanical precision. At 11.40 we steamed out of the station; and the travellers were soon in the arms of Morpheus. The train, however, was nearly an hour late in reaching Edinburgh, fogs having caused some delay during the night. On arrival, Mr. W. R. Herring was there to receive the visitors; as well as Mr. Canning Williams (lately removed from Reading to take up the position of Treasurer to the Edinburgh and Leith Gas Commissioners). Mr. J. Ferguson Bell (the Junior Vice-President of the Institution) was also present, and Mr. Charles Wood, Mr. John Bond, and probably (but at the time unnoted) others had come through to meet the travellers. Breakfast was served in one of the rooms of the Caledonian Hotel. Afterwards a special train was boarded, and soon the members found themselves on the platform of the private station

AT THE GRANTON GAS-WORKS.

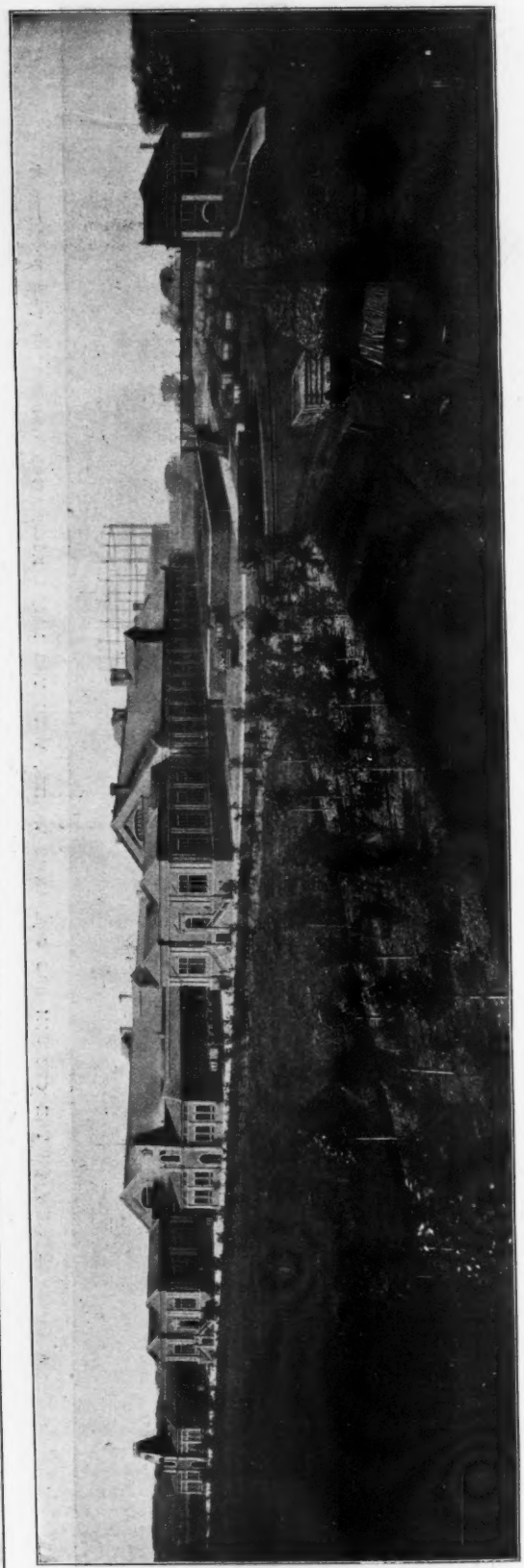
There was reception here by the representatives of the civic life and Gas Commissioners of Edinburgh and Leith whose names precede the report of the speeches at the luncheon. The visitors were quickly face to face with the greatest engineering feat in Mr. W. R. Herring's life-work. Knowledge of the works had already reached Germany through the "JOURNAL;" and there was an anxiety to see the real thing. Immediately the visitors were on the works, they grasped the systematic simplicity of the plans of the Engineer, from the arrangement of his railway lines throughout. The architectural features of the buildings (which give an impression of costliness, but which Mr. Herring has demonstrated really represents little more in outlay than plain brick building) were highly admired by these Continental practitioners; and no doubt before they left many of them learned that, in designing the works, the Engineer had to take into account the fact that the susceptibilities of the people of Edinburgh were not to be tormented when they turned their eyes in the direction of Granton. The Engineer succeeded in this matter. In going round the works, Mr. Herring was assisted by his successor-elect in the Engineership (Mr. Herring on his removal to London will continue to act in an advisory and supervisory capacity), Mr. A. Masterton, and the members of the staff generally—principally Mr. John Davie, Mr. H. Gracie, Mr. D. Bisset, and Mr. J. Jamieson. It was a beautiful day; the sun shining brilliantly. The huge creation, certifying great engineering skill, looked under these conditions at its very best. The route marked out for the inspection took the visitors from the coal-truck tipping arrangements through to the ammonia products works. The coal was seen broken, conveyed to the elevating plant, and removed to the hoppers at the top of the house in No. 2 section.

The inclined retort-settings were inspected; and at the end of the house was found the vertical retort-setting with which Mr. Herring is experimenting, but about which there is yet nothing special to say. Mr. Herring's ideas in this matter have already been described in the "JOURNAL;" and now he is merely continuing his experiments for information and improvement. The plant can be worked intermittently or continuously just as desired. It has an outside producer, and deals with 20 tons of Scotch coal a day—the producer, by the way, being of ample capacity for several more settings. It was noticed that the coke came out small; and Mr. Herring explained that his coke extractor was provided with claws specially for breaking the coke, as his principal market demands that it shall be small; and extraction and breaking are therefore done in one operation. Passing along, the company visited the exhauster and machinery rooms, the power house, the coke plant, the condensing and washing plant, the pumping-station, the purifying-house, the high-pressure plant, the workshops—in fact, every place was open to inspection; the last to be examined being the ammonia products works.

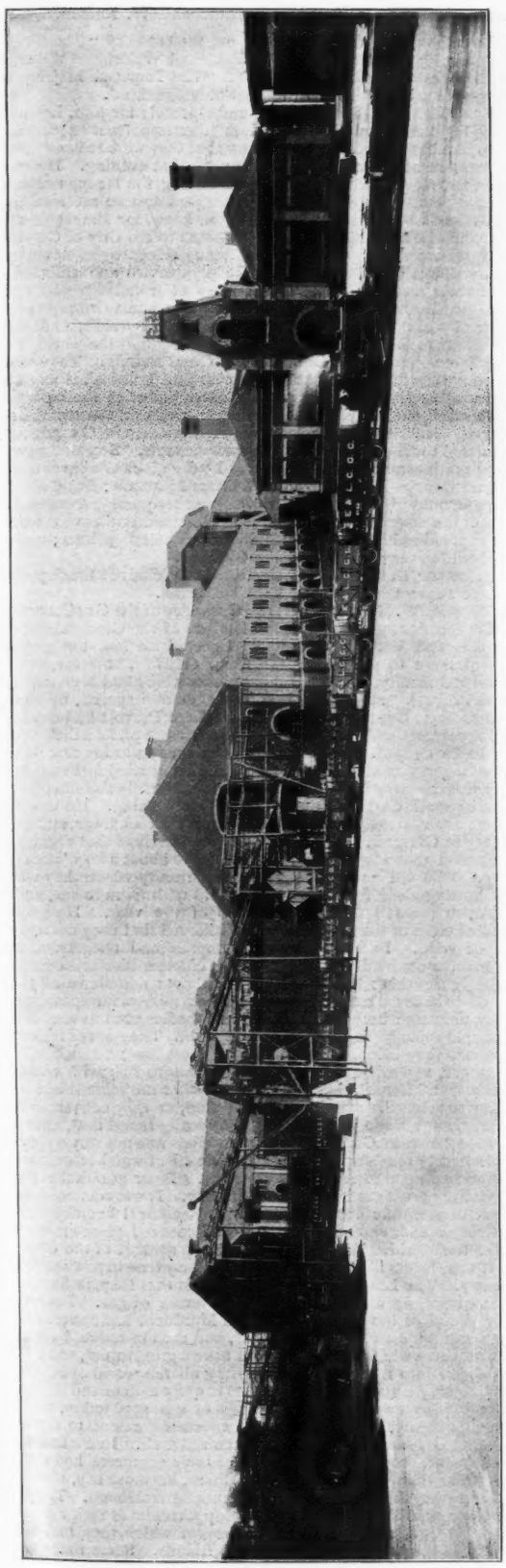
Returning to the main buildings, it was found that the technical office had been converted into a luncheon room; the decorations again showing, by flags and other emblems, Germany and England united. While we were waiting for the appointed time to arrive for the luncheon, Piper-Major Anderson (who is employed on the works), in Highland garb, entertained the visitors by an exhibition of his talented handling of the bagpipes. At the luncheon, Lord Provost Brown (Edinburgh) presided; and near him sat the two Presidents (Herr Prenger and Mr. Alexander Wilson), Herr Kordt, Dr. Bunte, and Mr. Herring. Present, among others, were: Provost Smith, of Leith, Sir Richard Mackie, Bailies Cullen, Geddes, Laing, Lindsay, Stewart, and Tod; Treasurer Calder, of Leith; Convener of Trades Duncan; Judges Bryson, Carmichael, Inches, and Pennell; Councillors Lewis, Harvey, Lyon, M'Michael, Rawson, Stark, and Wilson.

After luncheon,

The LORD PROVOST, without comment, gave the two toasts of "The King," and "The German Emperor;" and they were both duly honoured.



A GENERAL VIEW OF THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.



COKE TRANSMISSION AT THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

Provost SMITH (Leith) then gave the toast of "The German Association of Gas and Water Engineers." In the name of the Edinburgh and Leith Gas Commissioners, he offered the visitors a hearty welcome, and went on to say that they included eighty representatives of important public services, who were visiting not only Scotland but England, on an educational tour of inspection under the able presidency of Herr Prenger, who was the Manager of the Gas, Water, and Electrical Departments at Cologne. It would be invidious to name particular individuals from among so large a gathering of men eminent in their profession; but he might be permitted to express extreme regret that Professor Bunte, of world-wide scientific fame, and who had done so much to organize the visit, had been unable to take part in the journey. He was well aware that the feeling of friendship and brotherhood between the British and German Engineers was of no recent growth, but, on the contrary, of long standing; and that on more than one occasion British engineers had enjoyed the good fellowship and hospitality of their German brethren. The Gas Commissioners of Edinburgh and Leith had not forgotten the courtesy and attention shown to themselves some thirteen years ago, when a small Committee, accompanied by their Engineer, made an extended tour of the German works, and were on that occasion received with the utmost courtesy, and given every opportunity for inspecting and assimilating the leading features of the different works at which they called. They were, therefore, glad to welcome such an important and representative body of the industry of the great Empire of Germany; and they to some extent realized that their own works, which they had had an opportunity of inspecting that morning, were the outcome of both German and British thought. The gas undertaking carried a capital burden representing actual expenditure to the extent of £1,621,871, much of which was unfortunately obsolete capital, represented by the purchase of the original works. The liquidation of the dead capital, however, was proceeding apace; and no less a sum than £45,906 per annum was being contributed towards the extinction of the capital debt. The water-works, though not a commercial undertaking in the same sense as the gas undertaking, were a still larger factor—involving a capital outlay of £2,818,870, against which there was an annual contribution of £38,178 towards the extinction of the capital debt. They would be interested to know that the Granton Gas-Works were completed at nearly £30,000 below the estimated cost of £645,000; their Engineer, Mr. W. R. Herring, being the architect and engineer in their construction. It was gratifying also to observe that the working results were better by some 5 per cent. than was estimated, and that in the works more could be taken from a ton of coal than anywhere else in Scotland. The result of this was that, whereas prior to the erection of the works, the price of gas in the district was never less than 3s. per 1000 cubic feet, it now stood at 2s. 8d. for lighting, and 2s. 3d. for trade purposes, and would no doubt have been considerably reduced but for the heavy burden of old debt, to which reference had already been made. The visitors would also have observed the comparatively favourable conditions under which the workmen discharged their duties. They were provided with baths and canteens, and were enabled to carry on their work under what might be regarded as cleanly and wholesome conditions. The extensive use of machinery had brought the functions of the brain rather than of the muscle into fuller operation; and the Commissioners had the gratification of knowing that their employees were giving every satisfaction, and appreciated very highly what had been done for them. He need scarcely add that it had been a great pleasure to the Commissioners to have the opportunity of meeting so distinguished a company of German representatives, and hoped they had learned something by their visit to this country that might be of service to them when they returned to their homes. They trusted also that these and similar visits would tend to remove any misunderstandings that might exist, and to still further strengthen the feeling of kinship and of affection which they hoped would always subsist between their great country and our own.

The toast was enthusiastically received.

Herr PRENGER replied in the German language; his remarks, which were to the following effect, being afterwards interpreted by Dr. Lessing. After they had seen for two days, he said, the great works of the Metropolis, they came North to inspect, in the Scottish Capital, the works which the two towns of Edinburgh and Leith had at Granton. They came with the feeling that the Scottish people were, both in character and disposition, similar to Germans. Their patriotism, their love of home and of country, were both the same as they found it at home. They had, however, come as men of work, who wanted to find out the technical achievements which might have been made in this country. They had come to see one of the greatest engineering feats in the world—the Forth Bridge. They had seen at a glance what a beautiful gas-works they had there—the whole disposition, so clean, so simple, and so particularly suited to the work that had to be done. By simple means a lot had been achieved there; and beauty had not been forgotten in building the works, although it had been beauty from a utilitarian standpoint—simple and with a view to its objects. The works were a sign of the eminent capacity of their Engineer—Mr. Herring. The capital of Scotland and the town of Leith could be proud of what they had got there. They could be proud of their Engineer, and he was sure they all felt that it was a pity that Mr. Herring was going away from them. But he would be with them yet, and would co-operate with them, and would keep his paternal eyes on his creation. They saw there an example which they could safely take home with them to Germany, to copy, in the two towns of Edinburgh and Leith combining to build such beautiful works, and by this means bring about the highest possible economy and usefulness for the Corporations. It must often happen that there were people who, with narrow-mindedness, could only say: "This is my border, and my consideration is not extended beyond this." Many small works sprang up in consequence of this, and economy was not attempted. There they had two towns which had co-operated for the good of their citizens, and for the good of their country. They would take this example of true economy with them, and would try to emulate it. He thanked the Commissioners for the very kind hospitality which had been extended to them. He could only repeat that they had seen there much to take home with them. They had been received in the most hospitable spirit; and he asked his German colleagues to give expression to their thanks for all that had been done for them; for all the arrangements

which had been made, including the weather. [The concluding remark was received with loud cheering and laughter.]

Herr KORDT, in proposing "The Lord Provost and the Gas Commissioners of Edinburgh and Leith," said they had just come from the largest city in the world, where they had seen the biggest gas-works imaginable; but now they had come to a town which was famous for its art and science, and they would notice that in these gas-works regard had been had to art in perfection. The Gas Commissioners had done all they possibly could have done. They gave the funds to build these new works; and their wisest action, no doubt, had been in entrusting to their Engineer—Mr. Herring—the carrying out of the works. Not only were the works very beautifully arranged, but the beauty of them was of a practical nature. Human labour had been, wherever possible, replaced by mechanical means, so that it was not possible to see in them such scenes as were shown in the pictures on the walls of the room. [This referred to some old pictures of retort-house working, with men, almost naked, scoop driving.] The works had been built in the period of inclined retort construction; but they had seen that morning that Mr. Herring had already taken steps to go in for the construction of vertical retorts; and they were certain that, with his energy and knowledge of the work, he would be able to achieve the best in this direction. They hoped that his services would long be connected with the undertaking. He was, on the other hand, to be congratulated on serving under Commissioners who gave him the hearty support which alone made it possible to bring works of this kind to the height of perfection. He asked his colleagues, both English and German, to join with him in congratulations to the Commissioners.

Lord Provost BROWN, in response, said he endorsed all that had been said by the Provost of Leith. As Chairman of the Gas Commissioners and of the Water Trust, he gave them all a very hearty welcome to the place, and everyone desired that the visitors should go away realizing that they were in earnest when they said to them that the oftener there were meetings such as the present the better for the nations at large. The oftener that professional gentlemen, and working men—aye, and Statesmen likewise—met one another, as they were met that day, the less danger was there of the misunderstandings which they were constantly reading about, and having dinned into their ears, in the Press, from day to day. He was quite sure that a few decades ago, when cholera abounded at Hamburg and elsewhere, the engineers who came from Germany learned lessons, just as the Commissioners learned lessons in Germany, when they went there to take the advantage which was so kindly afforded them of seeing their works. It was quite true what the Provost of Leith had said about the price of gas; but he did not tell them (what they knew themselves) that while they were getting cheaper gas, they were not getting gas of the same quality, and that the consumers were not going to allow them to make too much of having cheap gas, because cheap gas meant expenses in other directions. He could assure them that they regretted very much that they were going to lose the services of their Engineer. He supposed that, although they had offered Mr. Herring a great deal more, they could not have kept him; he was in such demand all over the country as a skilled witness. Again, he said that they cordially welcomed their guests there that day, and trusted their sojourn in Scotland might be of such a nature that they would carry home to their own land pleasant and happy recollections.

The proceedings were brought to a close by the singing of a verse of "Auld Lang Syne."

Outside, motor chars-à-bancs were waiting; and these the visitors mounted, and, with cheers of farewell to their hosts and Mr. Herring, they left Granton to visit the Forth Bridge. A close inspection of such an engineering achievement as this could not be missed by any body of engineers visiting Edinburgh for the first time. But there was not much time to spare for lingering in its neighbourhood; and from there departure had to be made in time to catch the special for Glasgow at 5.10. *En route*, the visitors had much to talk about regarding their visit to Edinburgh. Then as we approached Glasgow, the great shafts of the factories in the outskirts attracted attention, belching forth continuous clouds of dense smoke. The visitors had heard of the crusade the Glasgow authorities had commenced against the pollution of the atmosphere by smoke; and they recognized what a big task they had taken in hand in the attempted suppression of this waste and nuisance.

IN GLASGOW AND THE BANQUET.

The Central Station Hotel at Glasgow was our destination; and by about 6.15 we were there. Rooms had already been allocated; and Dr. Bunte, Dr. Lessing, and Mr. Dunn were immediately engaged handing out the tickets to the members. As an instance of the completeness of the arrangements made for the comfort of the travellers, it may be mentioned that the bags that had been left on board the train at Edinburgh in the morning were found, each in its owner's bedroom, at Glasgow. Little time remained for dressing, to keep the appointment with the Lord Provost of Glasgow and the Convener and members of the Corporation Gas Committee, at a banquet at the City Chambers. Arriving there, the visitors were charmed with the beautiful and artistic architectural features of this far-famed home of civic administration, and when they reached the magnificent banqueting hall, they were inexpressibly delighted with its magnificence. But after all it only exemplifies the richness of the hospitality of the Glasgow City Council to the "strangers within their gates," who may be paying formal visit after the manner of our German friends. Some 246 sat down to the banquet; and a neighbour from across the North Sea whispered that it was "a great time." There was agreement.

Lord Provost M'INNES SHAW presided, and was supported on the right by Herr Prenger, Mr. Alex. Wilson, Deacon Convener M'Lennan, Dr. Paul Rottenburg, of Glasgow, Dr. K. Bünte, Dr. Beilby, Dr. Crawford, Herr Hasse, Herr Kobbert, and Dr. Lessing; and on the left by Bailie Dunlop, Herr Kordt, Mr. M. W. Montgomery, Herr Heidenreich, Sir John Ure Primrose, Bart., Herr Müller, Bailie Borland, the Rev. Alex. Brown, of Pollokshields, Herr Möllers, ex-Bailie Calderwood, Sir Wm. Bilsland, Bart., Herr Pfudel, Dr. Schütte, Herr Pohmer, Sir Nathaniel Dunlop. The croupiers were Bailies Russell, Paxton, Kirkland, and Guest, and Councillors W. B. Smith and W. Nelson.

The LORD PROVOST gave, in succession, the toasts of "The King;" "The Queen, Queen Alexandra, The Prince of Wales, and the Other Members of the Royal Family;" and "His Imperial Majesty the Emperor of Germany." These were all duly honoured.

The LORD PROVOST then said that, unfortunately for him, he had to leave this interesting function, to fulfil another important engagement, which he had contracted before he knew that they were to be honoured by the presence of their distinguished guests that evening. He could not, however, take his departure without voicing the feelings of satisfaction and pleasure with which his colleagues and he received their German friends that night. He spoke, he knew, for the whole community, when he bade them a hearty welcome to the City of Glasgow, in which, he was sure, they would find many things to interest them, and many points of similarity with the progressive and enlightened towns of their own country. The feelings of friendship and amity between the Germans and the British were of the warmest nature. Commercially and scientifically, they stood side by side; and there were no limits to the possibilities for good throughout the world, from the friendly co-operation of Germany and Great Britain. They would be untrue to their traditions, both personal and political, if anything but the most harmonious sentiments animated either of their peoples. They welcomed, therefore, with the greatest pleasure, the members of the German Association of Gas and Water Engineers in Glasgow, and congratulated them on their scientific achievements. Scotland gave to the world the inventor of gas—as it had kindly given the inventors of many other things—in the person of William Murdoch; but Germany had done much to perfect and develop subsequent processes and methods in the science of illumination. He could not leave the table without expressing his personal gratification at meeting them; and he wished them the very best of times in Glasgow.

Bailie DUNLOP, the Senior Magistrate, took the chair on the departure of the Lord Provost, and called for the next toast.

Councillor M. W. MONTGOMERY, the Convener of the Gas Committee of the Corporation, proposed "The Members of the German Association of Gas and Water Engineers." He said he had the greatest possible pleasure in submitting the toast. He felt, however, in very considerable difficulty, in view of the remarks which had been made by the Lord Provost. He had prepared an elaborate speech, by way of welcome to their German guests; but the Lord Provost had extended to them a welcome which, he thought, for warmth and cordiality, left nothing to be desired. His difficulty was to get on to his feet again; but the occasion was such that he thought, no one need feel very great difficulty in expressing his feelings. He was extremely delighted to see so many of their German friends there that evening. He was only sorry that their arrangements would not permit of their making a longer stay in Glasgow. Just fancy, they had arrived that night, and he understood that they had arranged to leave about two o'clock the next day. This did not give them the opportunity which they would like, of showing their friends all they would wish them to see, and of expressing to the full their appreciation of the visit. He greatly approved of visits of this character. He believed that they did a great amount of good. In these times, telephones and telegraphs, and rapid transit, undoubtedly did much to knit communities and countries more closely together; but he affirmed that, over and above all these things, and he believed more effectual than them all, was interchange and intercommunication between representative bodies such as that which had honoured them by their presence that night. They were divided by the seas, and they belonged to different nationalities; but when they came together, and when they exchanged opinions one with another, they found that, after all, they were striving after the same things, and attempting to solve the same problems. And, as they conversed and exchanged thoughts one with another, they really found that, after all, the distance between Germany and themselves was not so very great. He need scarcely touch upon the remarkable effect which interchanges of this kind had upon international relations. Their guests that night represented the great gas industry of Germany. It was common knowledge that in scientific attainments, and in technical knowledge, the German people had, and still occupied, an honoured place among the nations of the world. While this was true in general of the German people, it was, he could assure them, particularly true in relation to the gas industry. The Lord Provost had told them that they, in Scotland, claimed to have, as a countryman, the inventor of gas. They were naturally proud of the fact that William Murdoch, somewhere about 1792, lighted up his own house with gas, and thus introduced into the world an industry which was destined to have a great future, and which had developed into a tremendous industry all the world over. But, while saying so, he would like his hearers to quite understand that very important improvements in the methods of gas production, and in methods of lighting, they owed to an enormous extent to German enterprise, to German skill, and to German research. In confirmation of this statement, they knew that many of their engineers had visited Germany from time to time, and when there, he must say, they had received the very kindest and most hospitable treatment. They, in Glasgow, were therefore glad to have this opportunity of reciprocating, even to a small degree, the many kindnesses which they had often experienced at the hands of their German friends. Some time ago, a deputation was arranged by the Corporation of Glasgow to visit Berlin in connection with the Gas Department; and the gentlemen who went received not only the education and information which they wanted, but they also received the greatest kindness and consideration and hospitality at the hands of their German friends. They could not mention their German friends in connection with the gas industry without thinking of the name of Welsbach, and of the marvellous invention, and the great diffusion of light which had accompanied it, which had done more than anything else to give a new lease

of life to the gas industry. He was sure of this, that all their improvements, and all their skill, would have been as nothing but for this great invention—the incandescent mantle. They would observe that their friends were an Association of Gas and Water Engineers. He was not quite sure whether they wanted him to turn off gas and plunge into water. Time would not allow him to do so, however; but he felt one genuine regret, which was that their visitors had not time to visit their water-works at Loch Katrine, where, he was sure, they would see a combination of natural beauty and engineering skill which was rarely to be found. He would like their visitors to understand that they were most delighted to see them there; and they trusted that during their stay in Glasgow they would see something which would increase their appreciation of the work done in the city, and, inferentially perhaps, increase their appreciation of themselves as well. He had great pleasure in coupling with the toast the name of Herr Direktor Prenger; and he hoped they would give the toast a rousing reception, and show how greatly they appreciated the visit of their German friends.

The toast was received with great cordiality.

Herr PRENGER (who was received with loud cheers), in responding, said the kind words that had fallen from Councillor Montgomery had put him in a state of delight. After having seen the beautiful capital of Scotland and the engineering achievement of the Forth Bridge, they had arrived at the large industrial city of Glasgow. Here commerce, industry, and shipbuilding were the important features of the ancient city. Here it was that an enterprising people were, in their endeavours, one with Germany; and it was quite clear that their energy had left its mark on the technical institutions of the city. As engineers, they noted that the gas, water, and tramway systems were under the Corporation; and, as technologists, it was with pleasure that they heard of their Technological Institution. But above all, they were overwhelmed by the kind reception they had received at the hands of the municipal authority. The Lord Provost had spoken of the cordial relations between the two nations, and said there never could or should be a discordant note in these relations. As Germans, they subscribed to this sentiment with every fibre. Only people high in culture really achieved benefits to mankind, which, after all, were the objects of human endeavour. They were all very delighted by the kind words of welcome which had been spoken; and it added to their pleasure to come to the country that was the birthplace of the inventor of gas lighting. They were sure of this—that Glasgow always upheld the principles that were laid down by Murdoch, and that the gas supply of the city was of the highest character. In proof of this, stood their friend the Engineer and Manager of the gas-works; and further proof was seen in his selection as President of the Institution of Gas Engineers. Both the Lord Provost and Mr. Councillor Montgomery had spoken of the achievements of gas engineers. During the four days he and his fellow-members of the German Association had spent in this country, they had seen enough to satisfy them that Great Britain was in every respect capable of maintaining its position among the nations in their industry. He was sorry they had only come for so short a stay; but the winter's work was before them, and mankind prayed for light. They would be extremely glad to stop here longer; but their stay could now only be counted by hours. Their most sincere thanks, however, were due to all of them, not only for the interesting things they had seen in their capacity as technologists, but at the cordial and kind hospitality they had received in Great Britain.

Herr KORDT, in proposing "The Corporation of Glasgow," said that morning he had the opportunity of giving his impressions of Edinburgh, with its art and sciences. His first impression of Glasgow was that it was a centre of science, commerce, and industry; and the factories were a proof of the energy with which the work was carried on. They had heard from Mr. Wilson during the week as to the determination of the Corporation to combat most strenuously the terrible nuisance produced by the smoke; and in this endeavour the Corporation had hearty support. One could not help admiring the pluck and determination with which the Corporation were attacking this problem. But Mr. Wilson would do his part in carrying out the wishes of the civic authority in this matter.

The CHAIRMAN said he regretted that the Lord Provost was unable to remain to reply to this toast; but he and all his colleagues were pleased to welcome so many friends from that great country, Germany. In the speeches which had been made, they had referred to Scotland in the most flattering terms; and they showed that Scotland was a country to be reckoned with. Scotsmen in like manner had a great and sincere respect for the mighty Empire of Germany. If there was one country in the world at the present time that had been a model to them, that country was Germany. The competition of this wonderful country had inspired Scotsmen, who saw they must do all they could to maintain their supremacy. [Laughter.] A few years ago the idea of a Technical College in Glasgow was not heard of; but they learned that Germany was getting before them in this respect, and they said that Scotland must keep well to the front. Therefore there was a brotherhood between the members of the two nations. The very idea that the two countries should ever quarrel with each other was barbaric. Both nations had a great work to do in the world; and he believed they were doing it. Their meeting that day, though only perhaps in a small way, helped to combine the two nations. The citizens of Glasgow were delighted to extend a welcome to their friends from Germany. Many British gas engineers had visited Germany; and they had always been received hospitably. It was with great pleasure they had now the opportunity of extending the hand of friendship and hospitality to their German friends.

Bailie PAXTON proposed the toast of "The Institution of Gas Engineers." He remarked that the Gas Committee realized the great importance of the Institution in the British Isles, and had year after year sent a deputation to the annual conference. He had himself had the honour and pleasure of representing the Gas Committee at the annual conference on two or three occasions; and he could assure his colleagues that no deputation was sent from the Corporation of Glasgow which was more important or learned more of the scientific aspects of gas production even from the layman's point of view. He did not pretend to have any scientific knowledge of the making of gas; but even by the mere layman a great deal could be learned. He had noticed that the deliberations of the Institution were of the most technical character; and it had occurred to him that if the Institution would add a much broader representation of commercial men interested in gas it would be a great improvement, and of benefit to the gas undertakings of the country. He would suggest to the worthy President—their own able and estimable Gas Engineer and Manager—that something should be done to educate many of the gas administrators on the distribution side of gas supply. He submitted that there was a great deal to be considered and done at the present time in addition to the real manufacture of gas. In Glasgow, they were at present engaged in a crusade against an impure atmosphere; and it rested in great measure with the Institution of Gas Engineers to provide (he wished some genius would arise to give) a smokeless fuel. A great opportunity had now arisen; and he hoped that something would quickly come to take the place of the burning of coal. Next year they were going to have in Glasgow a Scottish Industrial Exhibition. The Institution of Gas Engineers were also coming to Glasgow for their annual conference, under the presidency of their friend Mr. Wilson; and as he (Bailie Paxton) explained to the members of the Institution when he was in London last June, a very hearty welcome awaited them in the city. He hoped when they came they would be able to say something to help in the matter of this awful scourge of a polluted atmosphere.

Amid much laughter, the band struck up "Lead, Kindly Light, amid the Encircling Gloom." The banqueting hall was electrically lighted; and the speech just heard had, as seen, largely directed attention to the murky atmosphere of the city.

THE INSTITUTION AND ITS WORK.

Mr. WILSON, the President of the Institution (who was received with ringing and continuous cheering), said that if Herr Prenger was overwhelmed with the reception he received, he was afraid he (the speaker) ought, after such an ovation, to bow his modest head. The author of the interesting air they had just heard suggested many thoughts; but he did not think he would dwell upon them now. The idea, however, of playing "Lead, Kindly Light," to a gas engineer was almost too flattering. They were quite aware that in lighting the gas undertaking always did the leading. His friend Bailie Paxton had spoken of the importance of the Institution of Gas Engineers; and he was sure the members of the Institution would take his words as coming from his heart—he having on many occasions attended the annual meetings, and had seen the work that was undertaken at these meetings. He knew that the whole of the members were earnest in their work; and it would be seen from what he had said that he thought the Institution was almost too technical. But he (the President) would point out to Bailie Paxton and others that the Institution must be technical; and they must follow out the lines of their technique to the utmost, if they wished to do the best they could for the gas industry and all the citizens whom they served. But Bailie Paxton had touched on a point with which he was sure all gas engineers would agree. He had been struck with the onesidedness of the meetings; and he thought, as a layman, that they would do much better if they introduced more of the commercial element at the gatherings. Perhaps he might tell Bailie Paxton that this idea had been brought forward by one of the most eminent men in the Institution at the present time. He referred to his friend Mr. James Helps. It was felt the Institution had a great deal more to do than the mere manufacture of gas. Of course, their first wish was to make and sell gas as cheaply as possible. This was certainly the first object of gas engineers. The next was they had to consider the question of getting a good outlet for the gas; and they could best do this by taking up the commercial side of the business, and by training men on that side as well as in the fundamental science of gas engineering. He had also spoken in London on this very point; and he was glad to think that Bailie Paxton was impressed by the importance of it. He thought also the gas industry ought to undertake in a more forcible way than it had done the education of their different communities in the proper uses of gas; and he was quite certain that if the Corporations, the gas companies, and the Institution all worked together, they would not only make the gas industry a very prosperous one, but they would also do a great deal towards the object that Glasgow had taken up so heartily—that was, the abatement of smoke in cities. There was no doubt that much might be done with smokeless solid fuels; but so far as he was concerned, he was more impressed with supplying gas of reasonable candle power, or rather reasonable calorific power, at the lowest possible price, because he thought that in gas they had one of the most convenient fuels that it was possible for the citizens to have, either for domestic or commercial purposes. Gas did not require storage by consumers; all that was required was the mere turning of a tap to get the necessary heating power. He supposed he felt rather strongly on this smoke abatement question. They had—as many of those present knew—a Smoke Abatement Exhibition now open in the city, and he wanted to bring the subject before the public as strongly as possibly, and, before the members of the Institution, the necessity and importance of advising and educating the public as to the proper uses of gas. With reference to the visit of their German friends, he could only add—what had been said by the Lord Provost, by Councillor Montgomery, and Bailie Dunlop—as to the feeling of dissatisfaction that their visitors were to be with them so short a time. They could have wished them to stay, not for a few hours but several days. If they could have given them a whole week in Glasgow, the city could have shown them not only matters of interest and importance in connection with the gas industry, but in regard to many of the other manufacturing industries of Glasgow. He hoped that at some future time they would have the pleasure of welcoming them again; and perhaps on another occasion they would be able to spare a little more of their valuable time. The Institution of Gas Engineers, however, had been favoured by having their German friends with them so long as a week. As the President of the Institution, he should like to thank the Gas Companies in London and the Corporations of Edinburgh and Glasgow for the interest they had taken in their German friends, and for the kindly way in which they had received them. The Institution were quite sure that would be the case; and that the projected visit had only to be brought before their various governing bodies to ensure a very hearty reception. He had likewise to thank Bailie Paxton for the kind way he had proposed the toast; and their visitors for the handsome manner in which they had received it.

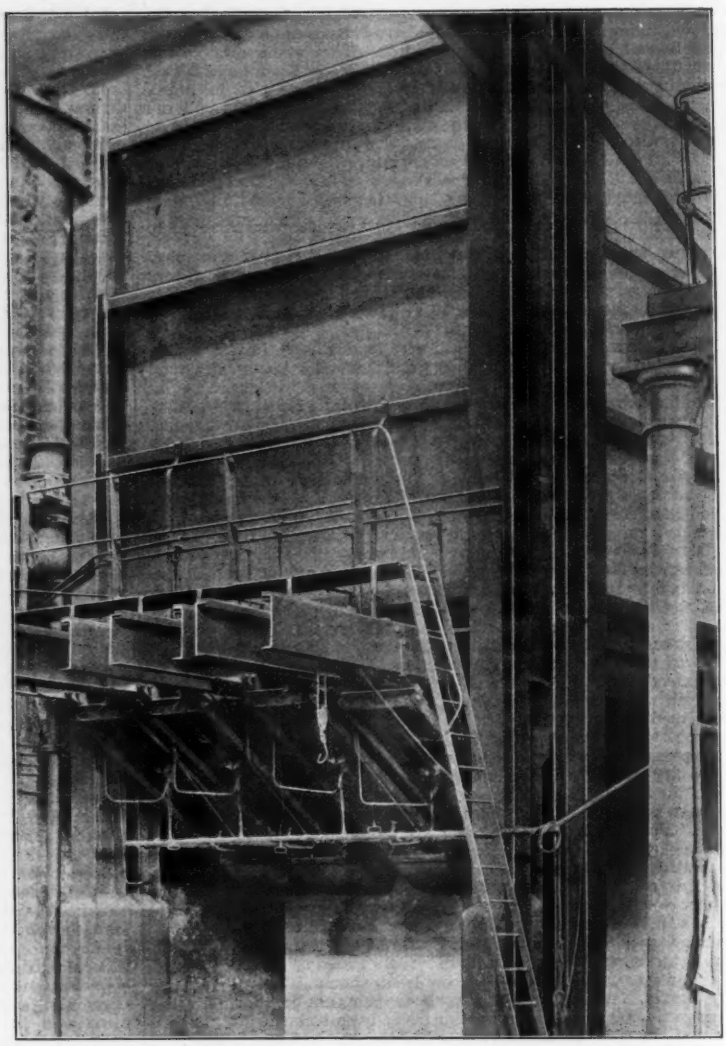
During the banquet and after proceedings, a splendid programme of music was rendered; and the introduction at intervals of some half-dozen pipers, who marched round the magnificent banquetting hall, greatly delighted the German guests. But the end of an evening (which had flitted away all too quickly) had now arrived. Before parting, however, the Scotsmen sang, and the Englishmen tried to sing,

Will ye no come back again?
Will ye no come back again?
Better loo'ed ye could'na be,
Will ye no come back again?

Then with a chaining of hands "Auld Lang Syne" was sung with much enthusiasm. "God Save the King" followed. Adieus were said, and the guests of the city were back at the Central Hotel by about 11.30.

THE GLASGOW EXPERIMENTAL VERTICAL RETORT-SETTING.

Next morning some half-dozen or so of the visitors were up betimes to keep a little private engagement with Mr. Wilson to inspect his experimental vertical retort-setting at the Temple works. It was too far away, and there would have been delay in carrying through the morning's programme (full as it already was for the time at disposal), had there been a general invitation. And, as a matter of fact, Mr. Wilson's work in this direction has been entirely confined to developing a setting and a system of working suitable to Glasgow conditions and to the splint coal usually employed there for gas making. His experience so far with the trial verticals, has been very encouraging; and by the time he comes to write his Presidential Address next year, he will have considerably more to say about the setting and his longer experiences than can be told now. We will not trespass on the ground reserved for a future occasion, other than to give to-day a little general information from its borders. The setting that Mr. Wilson has developed is something between the continuous and the intermittent system, as complete evacuation and charging is known. There are, in all, four 20 feet tapered retorts in the setting; and the top of each retort is 4 ft. by 10 in. in section—the bottom being 4 ft. 8 in. by 18 in. The four retorts deal with 14 tons of Scotch splint coal per day, or 3 tons 10 cwt. per retort. At the bottom of the retort, there is a shoot covered by a water-sealed cap, operated by a small hydraulic piston. When the cap is opened, about one-fourth of the contents of the retort is allowed to run out—representing about 7 cwt. of coke; and then from 11 cwt. to 12 cwt. of coal is charged in at the top. This is an operation that is regularly performed about every four hours. As the lid is opened, and the coke falls out, the small quantity of water that has served as a seal comes with it; and by the appearance of the coke, no further quenching is likely to be required. This possibly is also partly due to the fact that the retort is heated on the principle of having the greatest temperature at the top and diminishing towards the bottom. Scotch coal, such as that employed at Glasgow, is not of a character that will permit of constant movement, as occurs in a continuous system; hence the idea of only subjecting the charge to four movements, and four hours' repose between each, from entrance to exit. Examination was made of the coke produced with this coal in horizontal working; and it was very small. The coke from the verticals is larger and somewhat harder, and Mr. Wilson mentioned that he could get a better price for it.



The Discharging Arrangements of the Trial Bed of Verticals at Glasgow, as Designed by Mr. Alexander Wilson.

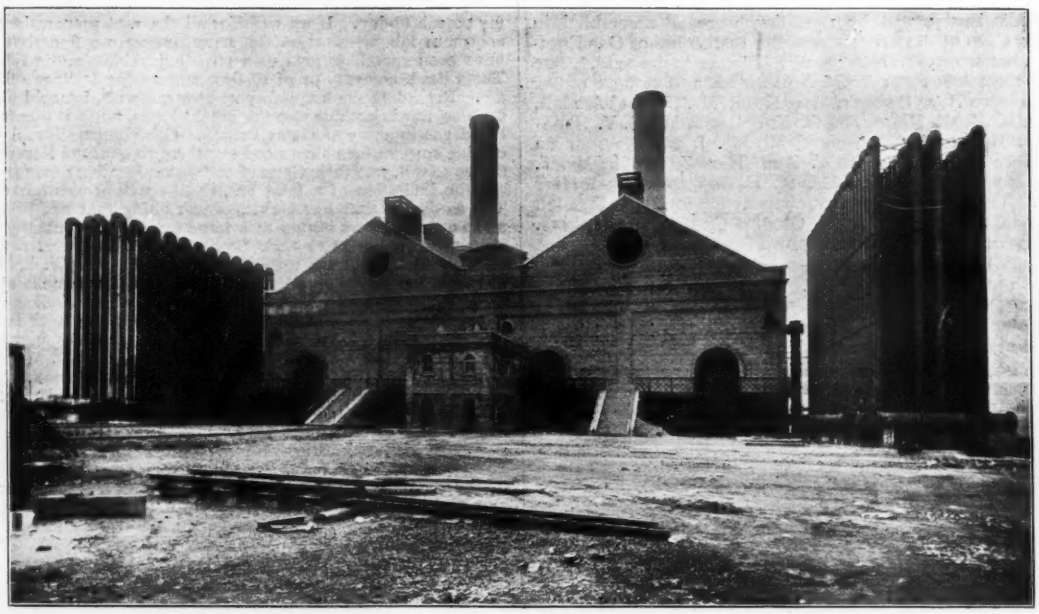
Mounting to the top of the setting, the charging arrangements were inspected. A coal-hopper running on rails feeds the retorts every four hours, or one an hour, as already explained. The charging is through a vertical feed roller, slightly conical in form, and having an 8-inch opening, which for the purpose of charging is brought round in the casing so as to face the hopper mouthpiece. The producer is also fed through the top of the charging-stage. Among other points it was learned that the retorts only require scurfing about once every five or six weeks; but should there in the meantime be any little sticking of the charge from any cause, there is at the top of each retort a small hydraulic piston to assist the charge. This is not often required; but there it is ready for use. When a retort is scurfed, it is off at most for twelve hours; and when re-charging commences, the first part of the charge consists of coke, so as to form a bed for the coal. The simplicity and cleanliness of the whole arrangement are features that struck the visitors. About it, there can be no waste or loss. The setting has been in use about seven months; and there have been no interruption of regular working. This speaks well for the design.

With regard to results from the Scotch coal used, some four years ago, about 9200 cubic feet of gas were produced in horizontal working per ton of coal carbonized; now something like 10,000 cubic feet are obtained. At the time of the visit to the verticals, the return showed a make of 10,700 feet per ton. The illuminating power of the gas is between 16 to 18 candle power with the No. 2 burner. Mr. Wilson could not remember the calorific power off-hand; but he knew that it was somewhat higher than for gas from the horizontal retorts. The advantages are, using Scotch coal of the type employed here, a higher make, with no depreciation of candle power, a rather better calorific value, an improved coke, cleanly conditions, and, certainly, one man at the top of a bench of such settings and one at the bottom ought to be equal to (say) the production of 3 million cubic feet of gas a day.

AT TRADESTON, THE EXHIBITION, AND PROVAN.

The privileged few who had been to the Temple Station, were back at the Central Hotel with a few minutes to spare before, at 9.30, the morning's programme was entered upon. Motor cars took the large party first to the Tradeston works, the Manager of which is Mr. Alexander Smith. To him as well as to Mr. Wilson's other technical assistants—chiefly Mr. Walter Grafton (Assistant Engineer and Manager), Mr. John Webster (Manager at Provan), and Mr. Andrew M'Leod (Manager at Dawsholm)—the visitors owe much of the interest derived from the visits during the morning. The works are briefly described elsewhere; but the visitors were particularly interested in the works at both Tradeston and Provan that bear so much evidence of the stern engineering skill of the late Mr. William Foulis. At Tradeston they examined the Arrol-Foulis retort machinery with considerable interest; and were highly pleased with the trolley trains with their diminutive engines removing coke with rapidity from the retort-houses.

From Tradeston a visit was paid to the Smoke Abatement Exhibition, which was about due to close its doors. The gas section dominated (as was seen from our previous notice of the show) the whole of the other exhibits. But the visitors evinced no partizanship in making inspection; viewing the electric house with the same thoroughness as the gas exhibits, though there were indications of an inclination to combat some of the statements made as to costs for heating and other purposes. The latest British manufactures for the utilization of gas were examined with avidity—particularly those for heating water by gas. Yet another object of especial interest was the "Nonpareil" ventilating inverted gas



At the Provan Gas-Works of the Glasgow Corporation.

sun-burner for lighting large interiors, which is lighted and extinguished from a distant control switch.

Then to Provan we went; and there in a few cases renewed, but in the greater number of cases made for the first time, acquaintance with the last great engineering work that Mr. Foulis left behind him—again a monument to a magnificent ability and capability for making the best of local circumstances in the planning and designing of a large works. The plainness of the buildings, but in their very plainness bold and striking, were noted by the visitors. They were quick to detect, too, how the varying levels of the site had been made use of in letting the incoming coal pass downwards from coal-store to coke disposal. The huge range of outside producers were the subject of much inquiry. The first section of Provan has a capacity of 12 million cubic feet. "Will the second section," asked a German visitor, "be also equipped with horizontal retorts?" Even Mr. Wilson cannot yet answer the question. His longer experience with the vertical trial setting (referred to above) may answer it. All parts of the big plant were inspected; but another special feature of interest was the arrangements for feeding and emptying the purifiers—the former from the overhead enclosed gangway, and the latter through bottom outlets in the boxes. The men's accommodation for meals, for washing, for reading, and for other recreation was examined.

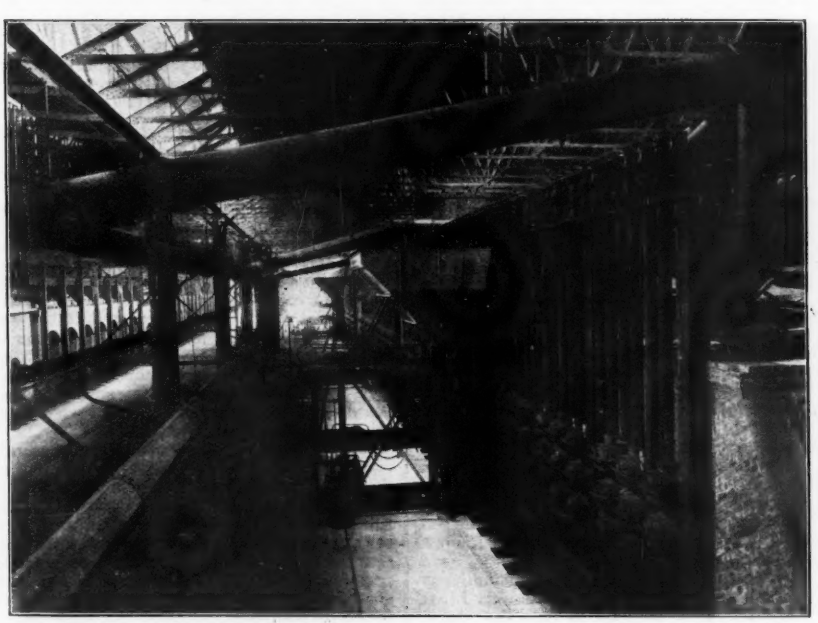
After passing through the huge works, the company were invited to partake of refreshments; and then a photographic record was made of the occasion. Immediately after Provan was added to the stock of memories associated with this visit, which will ever and again be revived when the beautifully illustrated souvenir is glanced at, in which excellent pictures of the works appear and photographs of some representatives of the Glasgow hosts.

TO LONDON AGAIN.

A smart run from Provan brought the party once more to the Central Hotel; and there were forty minutes or so to spare for minor preparations before the special train left for London. There was no personal worry throughout this long trip; and again it was found that the luggage was all ready for disposal in the train. Before the departure of the train, Mr. Councillor Montgomery came along, as did also Mrs. Wilson and the Misses Wilson, to bid the visitors "Good-bye" and a safe journey to their homes. This was the first time the German visitors had had an opportunity of meeting the President's wife and daughters; and the kindly thought that brought them to the station gave immense satisfaction to Herr Prenger and all those of his colleagues who had an opportunity of introduction and a shake of the hands. The nine hours spent on that "special" passed pleasantly. We lunched, we "tea'd," we dined—very appropriately (the major part of the travellers coming from Germany) on, as one wag ventured to point out, the intermittent system; we conversed, and we read. The train arrived at Euston about 11.15; and a quarter of an hour later, the motor-cars that had been sent to meet the travellers were all well on their way to the Westminster Palace Hotel.

A VALEDICTORY LUNCH.

Soon after noon on Saturday, many of the German visitors might have been seen going round the Japan-British Exhibition



Inside the Retort-House at the Provan Gas-Works of the Glasgow Corporation. An Arrol-Foulis Machine in the Foreground.

at Shepherd's Bush; and by 1.30, they were all assembled in the Garden Club at the invitation of the Institution of Gas Engineers, to a luncheon, at which "farewell" was to be said. The President (Mr. Alexander Wilson) presided, and ranged either side of him were Herr Prenger, Herr Kordt, Mr. Corbet Woodall, Dr. Bunte, Mr. J. W. Helps, Dr. O. Knublauch, Mr. S. Y. Shoubridge, Dr. Bueb, Mr. W. Doig Gibb, Mr. J. van Rossum du Chattel, Herr Pohmer, Mr. W. T. Reid, Herr Zolliköfer, Mr. T. Goulden, Herr H. Koppers, Mr. H. F. Andressen, and Herr Bernauer. There was one vacant chair at the top table through the unavoidable detention of Mr. Charles Carpenter elsewhere. But the following telegram was received from him:

> An unavoidable circumstance prevents me joining farewell luncheon to our German friends. I hope they have enjoyed their tour, and that they will have a safe and pleasant return journey home.

At the conclusion of luncheon,

The PRESIDENT said: Gentlemen, we have met you to-day not so much as gas engineers, but the keynotes of our proceedings are brotherhood and friendship. That being the case, I wish to couple the loyal toasts together, and to drink unitedly to our King and to the Emperor of Germany. We wish both of these monarchs long life and happiness; and we trust that both rulers of the two nations will ever stand shoulder to shoulder in the earnest endeavour to do what is right to protect the weak, and to do everything possible in the cause of justice and right.

The toast was enthusiastically honoured; both National Anthems being sung.

Mr. CORBET WOODALL then said: Mr. President and Gentleman, I am quite sure my friend, Mr. Carpenter, has some sufficient reason for not being present to share in the honour of proposing the toast which has just been entrusted to me. It is a pleasanter thing to welcome the coming guest than to wish God-speed to the parting one. We have, hosts and guests, seen much of each other during the week that has passed, and we members of the Institution of Gas Engineers hope our guests will carry away with them pleasant recollections of the time they have spent in Great Britain. One thing they may be fully assured of—they will leave with us only the happiest thoughts of them. I venture to hope that the notes some may have made during their visit, are not wholly of things to avoid; that some things in the works you have honoured us by visiting will be deemed worthy of remembrance, and possibly even of adopting—that, from a professional point of view, the journey has not been barren. These are, as we all know, strenuous times not only for our industry, but for most industries; and one thing we learn from our gathering here is that, in order that the industry may prosper to the full extent, we should not grudge to communicate one to another everything likely to be helpful to the whole. One part cannot prosper without its conducing—I think I may say that no part ought to prosper without that prosperity being shared by all. In other words, we cannot be advantaged by anything short of the best on the part of any of our members. In saying "Good-bye" to you, we as your hosts can only wish you smooth seas and prospering gales, and a very happy and safe journey home. On to-day's programme appear these words:

> Happy have we met,
> Happy have we been,
> Happy may we part,
> And happy meet again.

In other words, we say not "Good-bye" but "*Auf Wiedersehen.*"

Mr. W. DOIG GIBB: Mr. President, Herr Prenger, and gentlemen: At the eleventh hour, I have been asked to join Mr. Corbet Woodall in proposing this toast in the place of Mr. Carpenter. The last time I saw Mr. Carpenter he was looking forward very much to being here to-day; and I am certain there must be some serious reason for his not being present. When I visited Berlin three or four years ago as President of the British Institution of Gas Engineers, on the occasion that you gentlemen gave us such a magnificent banquet, I expressed the wish then that, in the years to come, we might be "Still closer knit in friendship's bonds each passing year." Surely to-day, to some extent, sees the consummation of that wish. We are closer and firmer friends than we were when we met you in the outskirts of Berlin; and, if I may once more quote the well-known words, I hope, in the years to come, we may be "still closer knit in friendship's bonds each passing year." I need not add anything to what Mr. Corbet Woodall has just now so ably said, excepting this: To the Scotsman (I am a Scotsman), the word "brother" conveys perhaps a deeper meaning than even it does to the average Englishman, because in Scotland a brother is a man one has to stand by whether he is in the right or in the wrong—one has to see him through as long as life exists. When we address you, therefore, my German friends, as brothers, we mean we have taken you to our hearts. We welcome you here. We hope you have had a good time; and if you have, we are amply rewarded. And you will show your appreciation, if appreciation is due, by coming back to see us. Good-bye for the time being, a pleasant journey, and a safe return to your own country.

Herr PRENGER replied in German, which was translated by Dr. Lessing. He said: Brethren and friends, we are at the end of the fine days we have spent in this country—both in England and Scotland. We have experienced the sincerest hospitality imaginable; and we have seen some of the largest works in our industry. The President has said that we have not met here to-day as gas engineers. We have met as friends, and not only so but as old friends. I am sure, Mr. President and colleagues, you will subscribe to this: We have been one in heart; and more it would be impossible to say in few words. We have learned that the only proper course to follow in our profession is to stand by each other, and to work together for the common interest of our industry and of our nations. Any one of us who may have arrived in London a week ago harbouring any other opinion than this must surely be converted by now, and must be convinced that England and Germany together must be able to rule the globe. Gladly would I take this opportunity of looking back, and giving you a retrospect of all that we have seen during our week's travels; but it would be impossible to do so, as I should not be able to finish my speech to-day. If we consider all the vast preparations, and the enormous labour spent on the arrangements, we find that no efforts have been spared to give us a most enjoyable time in this country. There has been every proof of how sincere the feelings on your side are. Regarding the hospitality we have met with, I should like to point out that this is not due to a few good friends, but it is due to the combined gas industry of Great Britain. Gas companies and gas-works owning corporations have stood together to enable the Reception Committee to welcome their German colleagues in proper manner. It was not the invitation of a few; but, so to speak, it was a national one. The cordiality that has pervaded everything that has been done to make us happy here is due to a large extent to the Reception Committee, and foremost to their Secretary, Mr. Dunn. I ask you, my German friends, to try to imitate his grand example. He must be in possession especially of a most correct watch [laughter], because we were always kept to our programme to a minute. But the whole Reception Committee have worked in an exemplary manner, and have produced for us a most enjoyable stay. We are here as the guests of the Institution of Gas Engineers and of its President, Mr. Alexander Wilson, whose splendid works we had an opportunity of visiting yesterday. The names of Wilson, Woodall, Carpenter, Helps, Herring, Doig Gibb, and others, have a good sound in our profession; and as long as men of their type are leaders in our industry, we shall rest assured that that industry will prosper. We beg to thank you for all we have been shown, and for all the kind attention that has been showered upon us. Be assured, we take back with us the most pleasant recollections, and the memory of it all will remain with us for many years. Mr. Woodall has been good enough to quote poetry. I will do the same.

> Nun sind die Freuden vorüber,
> Wir kehren zur Heimat zurück,
> Doch nehmen wir mit hinüber
> Ein unschätzbares Glück.
>
> Uns einen die gleichen Ziele,
> Uns eint ein gleiches Band,
> Wir tragen der Freundschaft Gefühle
> Hinüber von Strand zu Strand.
>
> Heil Euch! Ihr englischen Brüder,
> Wir reichen zum Abschied die Hand,
> Will's Gott, wir sehen uns wieder
> Da drüben im deutschen Land.

Poetic Translation by R. L.

> The joys of our meeting are ending,
> And homeward we have soon to turn;
> As back our way we are wending,
> We rejoice in the happy sojourn.
>
> United in common endeavour,
> Much closer than ever before,
> Of friendship a bond, not to sever,
> We stretch it from shore to shore.
>
> To you, English brethren, greeting!
> In parting take our hand;
> May the Lord soon permit our meeting
> You yonder in German land.

Literal Translation by W. J. A. B.

[This may serve to inspire a minor poet.]

> Now that the festivities are over,
> We are returning home;
> But we are taking away with us
> A joy that is beyond price.
>
> Both of us have the same aims,
> And a common tie unites us.
> We are carrying feelings of friendship
> Across from this to that shore.
>
> Here's to you! English brothers,
> We give you our hand at parting.
> An't please God, we shall meet again
> Over there on German ground.

I ask you, my German friends, to put all your feelings into the words which we usually cry, "*Hoch! hoch! hoch!*"

With great heartiness, the German guests complied.

The PRESIDENT: Herr Prenger and Gentlemen, this is an occasion on which one would have liked to have framed a really suitable reply; and I do feel this is not an occasion on which I can do full justice to it. However, if I have not the gifts, I hope you will take it from me that I yield to no one in my sincerity and cordiality. [Applause.] Herr Prenger has said that the Institution of Gas Engineers invited our German friends here. That is quite true; and we have been happy to do it. But we have been greatly assisted by various Gas Companies and Corporations in making it the success that it has been. Our German friends, too, have given us of their time; and they have spared no personal expense to make this visit as successful as possible. In that way, they have also aided us in our wish to meet them. In going round the various works with our German friends, no one could help being impressed by the earnestness with which they go into their business. They have all shown themselves deeply interested in gas technique of every kind; and the smallest details have not escaped observation. If they have been enabled to learn, even in small matters, from us, we are pleased. We have learned much from them. I have visited Germany on two occasions, and the visits were of the utmost help to me in my business, as I have no doubt similar visits have been to many others. But, gentlemen, although our German friends are so keen in business, no one will deny me for a moment when I say they are likewise "jolly good fellows all." They are men of our own hearts; and we can fraternize with them, not only in our business, but also in our pleasures. Visits of this kind are not only of great good to us in our profession, but they help in every way to smooth away difficulties or tension between the two nations. It would be better if we had more visits of

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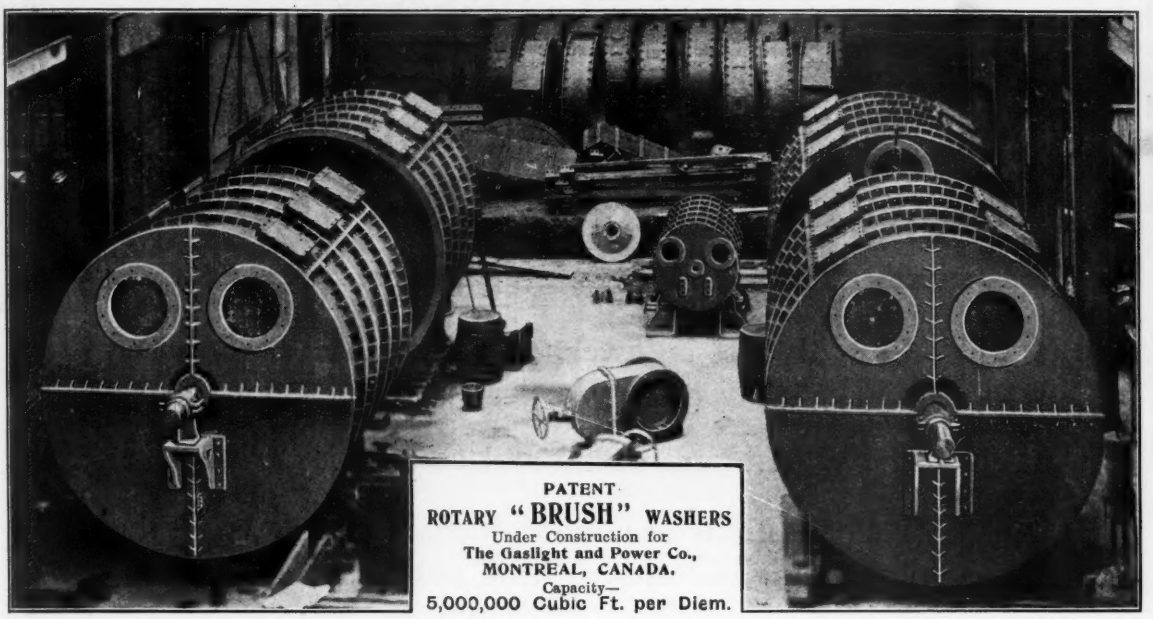

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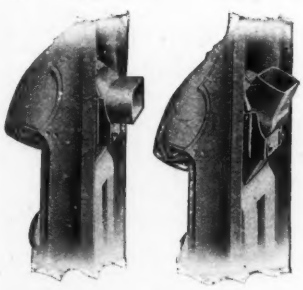

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this kind. There ought to be great opportunities for us in the future now that so many of us have met our German friends. We have been able to make friendships which, I hope, will last long. Herr Prenger has spoken of the work of Mr. Dunn. Great credit is due for all he has accomplished during this visit. He has shown great capacity for work in making the arrangements; and we are indebted to him for the excellent way in which the arrangements have been carried through. My friend, Mr. Helps, also had a great deal to do with the preparations. As I explained at the banquet on Monday, I have stepped in, as it were, and robbed Mr. Helps of the fruit of his labour. Personally, it has been very pleasant to me; and Mr. Helps in his magnanimity does not grudge me the pleasure. [Mr. HELPS: No, no.] At the same time Mr. Helps ought to have a great deal of the credit for the initiation of this work; and in the ordinary course of things, he would have been in the chair. We heard an old Scotch song at Glasgow, "Will ye no' come back again." We hope that this visit will be repeated; we hope, too, we shall have the pleasure of meeting our friends again in Germany. ["*Hoch.*"] The time has come to say "Good-bye." We hope you will all reach home safely, and will have pleasant recollections of your visit to Great Britain. [Applause.]

"Auld Lang Syne" was once more sung; and with individual handshakings and adieus, the end of a happy week's events was reached.

Saturday evening and Sunday morning witnessed the quitting of our shores by the majority of the visitors; but a few are remaining for two or three days' further holiday. A considerable number, however, left by the 9 o'clock train from Charing Cross on Sunday morning. At the special request of Mr. Corbet Woodall, Mr. F. W. Goodenough went to the station just before that hour; and, on behalf of him and the Gaslight and Coke Company, sped the parting guests, among whom were Herr Prenger and Dr. Bunte. The Governor had intended to be there himself, but felt rather fatigued after the week's exertions. Dr. Colman also turned up for a final "*Auf Wiedersehen.*" Everyone seemed to be very full of pleasant memories of the visit.

GASLIGHT AND COKE COMPANY'S STATIONS.

ORIGIN AND PROGRESS OF THE COMPANY.

The Gaslight and Coke Company, the first Gas Company to be established, was founded in 1810, incorporated by Royal Charter in 1812, and for many years was known as the Chartered Gas Company. In its early days, the Company's operations were, of course, on a very small scale; and the selling price of the gas distributed was 15s. per 1000 cubic feet. The site of the works in which manufacture was first carried on is now occupied by the Company's chief offices in Horseferry Road, Westminster. From time to time other gas companies were formed, until in 1860 some thirteen were selling gas in the Metropolis, many of them within the same area, and therefore in competition with each other. In the year named, the Companies agreed, in order to economize capital and to avoid too frequent opening of the public streets, each to confine its supply to a separate district; and this agreement received the sanction of Parliament. In 1868, Parliament further sanctioned a policy of amalgamation, with a view to the reduction of the Companies' expenditure. By the year 1883, the Gaslight and Coke Company had absorbed seven of the thirteen Companies, and became possessed of the statutory right to supply all gas required in nearly the whole of London on the north of the Thames, as well as a considerable area on the south. Last year, a further amalgamation (with the West Ham Gas Company, whose district lay in Essex, beyond the Metropolitan area) was authorized by Parliament; and the Company's district now comprises an area of upwards of 75 square miles. The amount of their capital is over £27,500,000.

Including the West Ham Company's district, the bulk of coal carbonized during the year 1909 was more than 1¾ million tons; and the amount of oil used in manufacturing carburetted water gas, upwards of 16 million gallons. The quantity of gas actually sold during the same year was 24,434,672,000 cubic feet; and the coke and breeze produced and sold during the year amounted to upwards of a million tons. The Company's largest output of gas on record for one day of 24 hours is 140 million cubic feet. Besides conducting the manufacture of gas, the Company have a tar and ammonia products works at Beckton, where the whole of the residuals are worked up.

The manufacturing stations of the Company, eight in number, aggregate a total productive capacity of 146 million cubic feet of gas per day, of which 32 millions would be made by carburetted water-gas plant. Of this total productive capacity, Beckton—the largest station—represents 71 million cubic feet. The gas is brought to London, at a comparatively high pressure, through two trunk mains, each of 48 inches diameter, which are in communication with the various other manufacturing stations of the Company, and with the district mains, by means of governors in various valve-houses upon the Company's district. The distribution system includes 2458 miles of mains, varying in diameter up to 48 inches. The whole system is so arranged that any part can be supplied practically from any of the Company's stations. The Company employ about 11,000 officers and workmen, the majority of whom are under agreement, and are members of a co-partnership scheme under which they become shareholders in the Company, and participate in the profits earned. In addition to this scheme, the Company have their own pension scheme for officers, make allowances to old and incapacitated workmen, and liberally support sick clubs for all branches of the workmen. The consumers now number about 675,000, of whom 395,000 use penny-in-the-slot meters. The number of gas stoves and fires in use is is approximately 550,000; and, in addition there are large numbers of gas-engines, hot-water circulators, and heaters in use.

The Company are under strict obligations with regard to the illuminating power, purity, and calorific value of their gas. The standard of illuminating power is 14 candles; of calorific value, 125 B.Th.U. per cubic foot of gas, measured at 60° Fahr.; and no trace of sulphuretted hydrogen is permitted. Testing by the public authorities is carried on throughout the whole of the day and night, except in the City of London, where there is a cessation of testing on Sundays. In the event of the Company failing to supply gas of the statutory quality, they are liable to substantial penalties, which are rigorously enforced. The price of gas is at present 2s. 8d. per 1000 cubic feet for private lighting, and 2s. 2d. for public lighting.

BECKTON.

This station, which, as readers of the "JOURNAL" are aware, is the largest in the Company's possession, is situated on the north bank of the Thames, about a mile below Woolwich. It is consequently specially well placed for receiving the supply of raw material and for the shipment of residual products. The quantity of coal landed is about 2 million tons per annum; and it is conveyed over the works by waggons of 5 tons capacity drawn by locomotives over a network of railway. The descriptions of these great works which have appeared in our columns from time to time on the occasions of visits of engineers, have rendered most of our readers familiar with their equipment; but the following particulars will probably be read with interest.

MANUFACTURING PLANT AND ACCESSORIES.

There are altogether fourteen retort-houses, varying in size, each containing from 30 to 45 settings—some of nine, but in the majority of cases of ten, retorts; their present carbonizing capacity being 58½ million cubic feet per day. The houses are for the most part arranged in two parallel lines extending inland from the river. The retorts are all set on the horizontal system; and they are charged and discharged by machinery of the Arrol-Foulis and West type. But a Fiddes-Aldridge machine is being installed. The first two systems are operated by pneumatic and hydraulic power; electricity will be used for the last. Each retort-house forms the nucleus of a works in itself, having its separate purifying plant, exhauster, condenser, and station meter. The connections are so arranged, however, as to be interchangeable, enabling the staff to effect repairs to any portion of one set of plant without throwing the remainder out of action. The material used in the purifiers is mostly oxide of iron; but a small quantity of lime is still employed for the removal of carbonic acid. The coal-gas plant is supplemented by carburetted water-gas plant, which was the first installed in this country. Its capacity is equal to the production of 13 million cubic feet per day. It is on the Lowe system, and consists of twelve sets.

STORING AND CONVEYING PLANT, &c.

The holders which store the Beckton gas are only to a limited extent situated within the works—19 million out of a total of 61 million cubic feet. The largest holder, of 8 millions capacity, has four lifts; its total height, when fully inflated, being 180 feet, exclusive of the height of the crown. The diameter of the tank is 250 feet. The gas is conveyed from Beckton in the direction of London in two 48-inch cast-iron mains, through which, owing to the distance from the Metropolis, it is necessary to pump the whole of the gas. The pumping plant consists of Donkin's exhausters, which work up to a maximum pressure of 48 inches of water. The necessity for this is shown by the fact that in the transit of gas to Bromley, 3½ miles from Beckton, 15 inches of pressure is lost when the main is being used to only a little more than two-thirds of its capacity. Gasholders into which gas from Beckton is pumped are situated as far west as Fulham—a distance of twelve miles in a direct line.

The total area covered by the works is 271 acres. Their river frontage extends half-a-mile; while their complete depth to the extreme land side is rather more than a mile. Besides the river front, a branch of the Great Eastern Railway is available for carrying material in and out of the works from the land side.

KENSAL GREEN.

These works are of a total manufacturing capacity of 15 million cubic feet per day; and they occupy an area of 28 acres. Their special features are the installation of vertical retorts on the Woodall-Duckham principle of continuous carbonization, the inclined-retort house, with its labour-saving devices, and the carburetted water-gas plant. These are described below; and other particulars in regard to the works will be found in the "JOURNAL" for Jan. 19, 1909 (p. 167).

INSTALLATION OF VERTICAL RETORTS.

This installation occupies part of the site of an old bench of horizontal retorts in No. 1 retort-house; and it was erected and set to work last year. The plant consists of ten settings, four retorts to a set, each retort being 23 ft. 6 in. long (exclusive of the iron mouthpieces), in eight lengths, seven of them being 3 feet long, and the eighth or mouthpiece end 2 ft. 6 in. long. The internal dimension of the retort at the bottom is 29 in. by 21 in., tapering to 21 in. by 9 in. at the top. The plant is constructed in

two parallel sections of five sets each, with the producers on the outer side of the sets, leaving a passage way of 9 feet between the sections. The capacity of the installation is 1¼ million cubic feet per day; and each retort will carbonize some 2½ tons of coal per 24 hours. The area occupied by the plant is 59 ft. by 58 ft., or make for make, less than half the ground space of the displaced settings.

The power required for working the installation is supplied by two electric generators of 63-H.P. and 20-H.P. respectively; the larger generator being used only when the coal is being broken and elevated to the overhead hoppers. On being received into the house, the coal is passed through a breaker, and elevated on to two push-plate conveyors running over the two sections, delivering coal into the storage-hoppers fixed immediately over the charging-drums of the retorts. The coal is fed automatically and continuously into the retorts through feed-roll drums kept continuously revolving at any determined speed by rocking shaft and ratchet apparatus. The retorts are worked at a high temperature at the top end; gradually lessening towards the lower portion, until at the discharging end a dull heat is reached. Here the coke passes into the discharging-drums, and quenched and emitted at every revolution of the drums on to the coke-floor placed beneath the settings. These discharging-drums can, like the feed-roll drums, be worked at any required speed. Fitted between the sections is an electric lift, for raising coke from the ground floor to the producers.

Inclined-Retort House.

This house contains 36 settings of inclined retorts set at an angle of 31°. The retorts are Ω shape, 24 in. by 14 in., eight to a bed. They are worked with 8½ cwt. charges three times in 24 hours; giving the house a total manufacturing capacity of 4 million cubic feet per day. The special features are the coal and coke handling plant. The coal is deposited in the main coal-breaker from barges in the dock by grabs, elevated to the main push-plate conveyor running over the settings, and conveyed into overhead storage-hoppers and charging-shoots fixed the whole length of the house. Coal-stores of 5000 tons capacity run along each side of the settings. They are fitted up with push-plate conveyors for loading the stores, and continuous conveyors for emptying the coal out of the bunkers and carrying it to elevators fitted on each side of the house for depositing it on to the main conveyor over the sets.

The hot coke from the retorts is directed on to De Brouwer conveyors fitted at the stage level, which remove it to the centre of the house, where it is quenched and conveyed outside to a series of hoppers capable of holding some 250 tons. Here the trade is supplied direct from the hoppers to carts, trucks, and other conveyances.

The power required for this retort-house is supplied as to coal breaking and conveying plant by Galloway compound steam-engines of 120-H.P. in duplicate, and for coke handling by duplicate gas-engines of 40-B.H.P.

Carburetted Water-Gas Plant.

This plant contains six sets, each capable of making upwards of a million cubic feet of gas per day. The coke for the generators is loaded direct from the retort-house storage-hoppers into trucks, and drawn to the plant by small locomotives. The trucks are raised above the charging-floor by a hydraulic lift, and the coke is tipped on to a De Brouwer conveyor travelling from end to end of the house, filling the charging-hoppers, which are fixed directly over the generators—an adjustable charging-shoot joining the two. In connection with this plant there are four Babcock and Wilcox boilers, Westinghouse engines of 40-H.P. being employed in driving the Sturtevant blowers producing the air blast. The oil storage is of 2 million gallons maximum capcity; and separate plant for screening and grading the pan refuse is fixed close to the house.

FULHAM.

This station covers an area of about 26 acres; and it is connected by a tidal creek with the River Thames at Chelsea, by which means the supply of coal is brought by barges from Beckton. These are unloaded by grabs, and the coal is broken and conveyed by machinery to the various parts of the works. The total capacity of the station is about 11 million cubic feet per day; being 8½ millions of coal gas and 2½ millions of carburetted water gas.

Retort-Houses and Machinery.

There are four retort-houses in use, three of which (Nos. 1 and 2 and 4) are equipped with inclined retorts—eighteen beds of eights, 24 in. by 16 in., and 20 feet long—set at an angle of 31°, and have a daily productive capacity of 2 million cubic feet each. The third house has lately been reconstructed, and furnished with twenty beds of ten horizontal through retorts, 23 in. by 16 in., and 20 feet long, in five tiers. These retorts are operated by the Fiddes-Aldridge machine, worked by electricity generated by gas power. It places in the retorts an average of 10 cwt. of coal; and with this the house is capable of producing about 3½ million cubic feet of gas per day. Complete coke handling and storage plant is provided for each of the three retort-houses now in use; that in the third house being worked by electricity. The three-shift system is in vogue, with eight-hour charges, in the three houses; the production of gas per ton of coal averaging 11,900 cubic feet. There is another retort-house containing eighteen beds of six through retorts, 21 in. by 13½ in., and 20 feet long, worked by hand; but it is only used in the event of a heavy demand arising for gas in the winter months.

Condensing and Purifying Plant.

On leaving the exhauster-house, the gas is divided into two streams, each having a set of condensers, naphthalene extractor, and tower scrubbers for taking out the ammonia and cyanogen. A "Standard" centrifugal washer, capable of dealing with 4 million cubic feet of gas per day, has just been erected. After passing the scrubbers, the gas is divided into three streams for the purpose of purification; the material employed being oxide of iron, with Weldon Mud in the catch vessels. Each section of the purifying plant comprises four oxide and two "mud" boxes, of an average area of 930 square feet.

Carburetted Water-Gas Plant.

The installation of this plant has lately been re-modelled, and the building containing it enlarged. There is now room for three sets, each having a capacity of 1¼ million cubic feet per day; but only two sets have been erected. The latest type of twin generator sets of Messrs. Humphreys and Glasgow has replaced the old plant, with greatly improved results; the fuel used being reduced and the daily productive capacity increased. The air blast is obtained by Sturtevant blowers, the largest of which is driven by a 50 B.H.P. De Laval steam-turbine. The gas is purified by oxide of iron only.

SOUTH METROPOLITAN GAS COMPANY'S WORKS.

ORDNANCE TAR-WORKS.

On reaching this station, it was considered to be for the convenience of the visitors to start at the tar-works, where the whole of the tar produced by the Company—about 50 million litres (1000 litres = 220 gallons) per annum—is brought for distillation. The process is only carried as far as the primary products; it not being deemed desirable at present to produce the finer chemicals or colours. The works stand on a site formerly occupied by a manufactory of ordnance, and thus obtains its name. The chief apparatus of interest in the plant is the stills, which are of the continuous type as distinct from the ordinary intermittent pot stills. There are three of these, having a total distilling capacity of 250,000 litres of tar daily: No. 1, 73,000 litres; No. 4, 109,000 litres; and No. 5, 68,000 litres. The tar is delivered through a 23 cm. (10-inch) cast-iron pipe from the neighbouring East Greenwich works; and from the other five stations it is received in tank barges. It is stored in an underground well of about 6 million litres capacity, and in various storage tanks, where it is allowed to settle to separate the ammoniacal liquor. Each continuous still consists essentially of a coil having a total length of about 804 metres (1 metre = 3·28 feet) in the case of the largest still, and a set of condensers maintained at such temperatures as to successively cool the various products of distillation. The products, except the pitch, are completely vaporized during their passage through the coil, which lies horizontally over the furnaces; liquid fuel being employed. The process employed is the converse of a true fractional distillation; and it might be correctly called "fractional condensation." Crude tar is used as the cooling medium in the condensers; and it is thereby heated to such an extent as to dehydrate it, and deprive it of most of its light oils, before it passes through the coil of the still itself. There are thus obtained the following crude products: Pitch, anthracene oil, creosote oil, light oil, and naphtha.

The pitch is run through steam-jacketed pipes to cooling tanks, and subsequently to the pitch "bays." These bays have a total storage capacity of about 10,000 tonnes (metric). The pitch is loaded into steamers and barges by means of a Temperley transporter, capable of handling 400 tonnes per day. The crude anthracene is cooled out, and the oil separated by centrifugals, giving a good quality of anthracene. The creosote is agitated with caustic soda solution for the extraction of phenols, which are rectified by fractional distillation; and it may then be subjected to treatment for the removal of naphthalene if desired. It is, however, generally stored in tanks until ready for shipment. The light oil and crude naphtha are fractionally redistilled to separate the naphthas from the higher-boiling constituents; and the products of this distillation are agitated or "washed" with dilute sulphuric acid so as to remove pyridine, and afterwards with concentrated acid to destroy impurities—the washed spirit being finally rectified to produce benzol, tuluol, and solvent naphtha. The crude naphthas and their products are all very inflammable, and are consequently stored in underground tanks.

GAS-WORKS.

The Gasholders.

On entering the gas-works, the most prominent objects are the gasholders, of which there are two. No. 1, erected in 1885, has four lifts varying from 73·5 metres to 76·2 metres in diameter and 13·7 metres deep. It contains 226,520 cubic metres of gas. No. 2, built in 1891, has six lifts, two of which rise above the framing. The holder has a capacity of 339,780 cubic metres. The combination of the bracing in this holder is such that it acts not only in tension but in compression, in accordance with the varying strains produced by the wind pressures. The late Sir

George Livesey considered that the limit in the economic use of material had probably been reached in this last type of holder, which, inclusive of tank, cost complete 3·61 marks per cubic metre of capacity. It is not now customary to depend upon the static pressure given by the holders for the delivery of gas through the distributing mains. The inner lift of the holder only balances a pressure equal to 73·66 mm. of water. Centrifugal fans are therefore provided, not only to raise the pressure of gas at the inlet of the distributing governors, but to increase the rate of flow through the two trunk mains, 1·21 metres in diameter, by which the gas made at East Greenwich is sent to the storage station attached to the older works of the Company.

Coal Unloading Plant.

The party next proceeded to inspect the coal-unloading jetty. Coal is brought from the North of England to the works by steamers carrying from about 1000 to 4500 tonnes. The vessel is berthed alongside the jetty at high water, resting on the shore of the river-bed when the tide is down. Four hydraulic cranes, with self-acting grabs, perform the work of lifting the coal from the ship's hold, and discharging it into storage hoppers. The height from the hold to the top of the hoppers is 22·87 metres; and the weight of coal lifted by each grab is about 1·25 tonnes. The radius of each crane is variable from the maximum of 11·66 metres from the centre to a minimum of 4·57 metres. The cranes are operated by hydraulic power of 49·21 kilos. per square centimetre; and each weighs about 50 tonnes. The coal is conveyed from the hoppers by trains of 14 waggons, each holding 5 tonnes, and drawn by steam locomotives. The hoppers hold 173 tonnes, and this capacity allows continuous working of the cranes, irrespective of any irregularities in the rate at which the coal is drawn away. The jetty was originally ⅂ shaped; but it has been extended in the form of a T—the older portion being generally used for the loading of large vessels with coke. It is intended to add four additional cranes to the newer end, so as to enable two ships to be unloaded simultaneously.

Retort-Houses and Machinery.

The retort-houses next claimed attention. It is intended that these shall be in blocks of four, the first set of which is erected and at work. A commencement has been made with the secod block, the first house of which is built and partly occupied. The structures are designed to be parallel with the river, and at right angles to the elevated railway which runs from the jetty. This affords ready and economical means for supplying each section with coal, and for the transport of the coke and breeze produced in the process of manufacture. The retort-houses are 148 metres long and 21·6 metres wide. The capacity of each coal-store is about 6600 tonnes. The retort-houses contain 45 settings, in three benches of fifteen, each with ten retorts in a setting. The section in general use is Ω shaped; but the last renewals have been made with retorts of elliptical section, which afford increased facilities in working.

The stoking machinery in all the retort-houses consists of the Arrol-Foulis chargers and the Hunter-Barnett dischargers worked by hydraulic pressure. The retorts are 6·1 metres long, exclusive of the cast-iron mouthpiece, and their cross section is about 0·53 metre by 0·39 metre. Each charge consists of 560 kilos. of coal; the duration of carbonizing being twelve hours. The time of charging a retort is 40 seconds, and of discharging 20 seconds. The gas produced averages in quantity 33·45 cubic metres per 100 kilos, has a calorific value of 5225 calories per cubic metre, and an illuminating power of 16·65 Hefner candles by the No. 2 "Metropolitan" argand, which is the official testing-burner. This represents 16·65 Hefner candles with gas burning at the rate of 141·6 litres per hour. The coke and breeze sold are about 50 per cent. by weight of the coal carbonized. Most of the settings have a single furnace on each side; but in the latter type, each double furnace heats three complete settings with economy of fuel and labour.

It should be mentioned that the present stoking machinery has only been installed a few months, displacing power rakes and scoop chargers actuated by a high-speed wire rope. With the use of power rakes and scoops, a good deal of wear and tear takes place; and the whole of the retorts are not at present in the best condition for the use of "pushers." But this defect will gradually be eliminated as time goes on and the retorts have to be rebuilt. The cost for labour in the retort-houses works out to 150 pfennigs per tonne. German-made retorts are used at these as in other works of the Company; and it is affirmed that they last longer, and keep their shape better, than the home-made production. The clinkering of the furnaces is done from a tunnel under the centre of the bench, which allows the various operations to be conducted irrespective of the stoking of the retorts, in the course of which large quantities of red-hot coke are drawn into the retort-house vaults, and there quenched prior to being loaded-up into waggons. These waggons are then drawn out by steam locomotives, and the trains of coke are either loaded into barges or conveyed to the store heap.

Condensing, Exhausting, and Purifying Plant.

The flow of gas from the foul-gas main is controlled by equilibrium governors of very simple type; and the regularity of the exhaust is registered by continuously working gauges. Condensation is effected by a combination of air and water cooled condensers; the first portion consisting (for each retort-house) of a coil of pipe 91 cm. diameter and 460 metres long. The water cooling is carried out in alternate chambers of gas and water about 1·82 metres high by 27 cm. wide, through which gas and water flow in opposite directions.

The exhauster-house contains six sets of engines, each working two exhausters, and provides a margin of some 50 per cent. in excess of winter requirements. The engines are of the well-known "Farey" type, compound, horizontal, and steam-jacketed. The peculiarity of their design is that the front and back crossheads are coupled up by means of stiff side rods, and relieve the cylinders from much of the dead-weight of the pistons. The engine dimensions are: High-pressure cylinder, 23 cm. diameter; low-pressure cylinder, 37 cm. diameter; stroke, 41 cm. Similar engines are used for driving, by means of belting, the tar, liquor, and water pumps.

The washing plant consists of Livesey washers worked three in a set, through which the gas passes in series. The vessels are placed at different levels, so that the ammoniacal liquor which comes from the scrubbers flows through them without pumping. Scrubbers are provided in sets of two or three; clean water being used to extract the final traces of ammonia. The scrubbers are filled with wooden boards, 28 cm. deep and 6 mm. thick, and with 18 mm. spaces between them. This arrangement was devised by the late Sir George Livesey many years ago; and it provides a large surface for the extraction of the gaseous impurities.

The dry purifying plant was originally laid out for the reduction of sulphur compounds by the lime process, and is in sets of six. The first four vessels work in rotation, and in these lime was used; and the last two, charged with oxide, were required for the complete removal of the sulphuretted hydrogen. The purifiers are 21·3 metres long, 9·1 metres wide, and 1·5 metres deep. The covers are lifted high enough to provide protection against weather to the men when charging and discharging them; and, to save expense, only sufficient covering to the plant is provided for the storage of the materials used, whether oxide of iron or lime. A Livesey washer for the extraction of naphthalene is connected to the outlet of each set of purifiers.

CHEMICAL-WORKS.

The chemical-works, occupying an area of about 1·2 hectares, are situated at the southern extremity of the gas-works, and have a river frontage of about 274 metres. They consist of sulphuric acid and sulphate of ammonia plant.

Sulphuric Acid Plant.

This plant is on the well-known chamber system, in four units, capable of producing 61 tonnes of 1·62 specific gravity acid per day. Each unit consists of a spent-oxide kiln, a Glover tower, 3·4 m. by 2·4 m., and 9·1 metres high, four chambers, each 33·5 metres long, 6·1 metres wide, and 5 metres high, and a Gay-Lussac tower, 3·4 m. by 2·4 m., and 12·2 metres high. Seven tonnes of spent oxide, containing 45 to 50 per cent. of sulphur, are used in each kiln per day; and the necessary heat of the kiln is maintained by the combustion of the sulphur. Nitrous oxide, the oxidizing agent, is produced from nitrate of soda; 12·7 kilos. being used per tonne of acid. The four Gay-Lussac towers are connected to a large absorbing catch tower 4·9 m. by 4·6 m., and 9·1 metres high, where any nitrous oxides passing from the Gay-Lussac tower are absorbed. The draught on the apparatus is regulated by a fan. An acid-concentrating plant is attached to the acid-works, for concentrating chamber acid up to 1·84 specific gravity for commercial purposes. The plant is on the Kessler system; and from 4 to 8 tonnes of acid, according to the strength required, can be concentrated per day.

Sulphate of Ammonia Plant.

In this plant two units are completed, capable of making 43 tonnes of sulphate per day from liquor containing 1·7 per cent. of ammonia. Each unit deals with 318,000 litres of liquor per day, and has two stills, each 1·8 metres in diameter. The ammonia from both stills passes into the saturator, 2·2 metres in diameter, where it meets the sulphuric acid. The acid and the ammonia combine to form sulphate of ammonia, which crystallizes and falls into the well of the saturator, from which it is ejected by a steam-jet into the centrifugal machine. It is then dried (the mother liquor running back to the saturator), and the crystals fall from the centrifugal by the bottom discharge-valve, and are elevated and conveyed into the stores. The saturator working in No. 1 plant is eight years old, and has made 42,670 tonnes of sulphate of ammonia. The sulphuretted hydrogen evolved in the process is cooled and conveyed to the acid plant for conversion into sulphuric acid.

The engine is of 70-H.P., with cylinders 30·5 c.m. and 55·9 c.m. diameter and 66 c.m. stroke. It drives the liquor-pumps, river-water pumps for cooling the saturator gases, boiler-feed pumps, centrifugals, and the elevating and conveying machinery for both units. The boilers are six in number, each 2·4 metres in diameter and 8·2 metres long, consuming coke breeze only. The steam is delivered at a pressure of 5·3 atmospheres and is reduced to 1·3 atmospheres before entering the liquor stills. The stores are capable of holding upwards of 4000 tonnes of sulphate, and from them it is elevated into the overhead hoppers of the bagging-room, where it is filled into bags and weighed. The bags are then placed on a "Slat" conveyor and carried to the loading wharf, automatically counted, and put into barges.

CROYDON GAS COMPANY'S WORKS.

At the commencement of the operations of the Croydon Gas Company, in 1847, the works were situated in the centre of the town; but in 1867 new ones were completed on the present site at Waddon. They comprise two complete sections of coal-gas plant, each capable of dealing with about 4 million cubic feet of gas per day, and carburetted water-gas plant having a daily productive capacity of upwards of 3¼ million cubic feet. The old section is being gradually remodelled and brought up to date; the other is quite new, and was opened in 1907. The works, which, as readers are aware, are under the supervision of Mr. James W. Helps, M.Inst.C.E., the Engineer and General Manager of the Company, have on several occasions been described and illustrated in the "JOURNAL"—the last being as recently as in June, on the visit of the members of the Institution of Gas Engineers. It is only necessary, therefore, to give a few general particulars.

Dealing first with the old section of the works, one of the retort-houses has been remodelled and enlarged, and now contains fifteen settings of 22 in. by 16 in. Ω retorts, put in by the West Gas Improvement Company, Limited, who supplied the stoking machinery and the coal-elevating and coke-handling plant—the former being driven by compressed air and the latter by electricity. Charging is done at both sides by means of the above-named firm's latest form of scoop, which allows of the retorts being fairly well filled with about 10½ or 11 cwt. of coal. The coke is pushed out by a discharger from one side of the house, falls on to a conveyor driven by an electric motor of 9-H.P., is extinguished by sprays of water under a pressure of 60 lbs. per square inch, and eventually drops into shoots having automatic valves through which the coke-skips are filled. The skips deposit the coke in hoppers capable of containing 500 tons. If it is to be broken, this is done by two of Cort's breakers, in addition to which there are two "Marcus" screening conveyors, each capable of dealing with 30 tons of coke per hour. This conveyor was fully described and illustrated in the "JOURNAL" for May 31 last (p. 553).

The retort-house in No. 2 section is 400 feet long, and contains 29 through settings of eight retorts, worked by West's compressed air machinery. The house contains four sets of coal-elevating machinery; and governors are used throughout. The coke produced is either drawn direct into the producers, or is carried by De Brouwer conveyors to the screens, which divide it into two sizes. The plant in the house is driven by "National" gas-engines. The principal novelty in this section of the works is the system of treating the gas for the prevention of naphthalene deposits. It has already been described in the "JOURNAL," but may be again briefly alluded to. The gas first passes through Dr. Colman's "Cyclones," which take out the heavy tars; it then goes through a Livesey washer containing carburetted water-gas tar, heated by a steam coil, which extracts some of the naphthalene, and gives up to the gas a considerable quantity of the lighter oils. Subsequently it passes through specially-designed water-tube condensers, constructed by Messrs. Clapham Bros., in which it is cooled; the products of condensation flowing by gravity to the seal-pots, which are all placed outside the house. The gas finally goes through Livesey washers and "Standard" scrubbers. By this special treatment of the gas the products of condensation are kept liquid, and all obstructions by naphthalene are avoided. The purifiers are of the luteless type. There are six of them, each 40 feet square; and they are charged with oxide of iron.

The Company treat their ammoniacal liquor; and the works comprise plant equal to the production of 40 tons of sulphate of ammonia per week. It is furnished with centrifugal drying apparatus and conveyors.

The Company's district extends over 80 square miles, and includes 252 miles of mains.

EDINBURGH AND GLASGOW GAS-WORKS.

Granton Works of the Edinburgh and Leith Gas Commissioners.

On reaching these works by special train from the Princes Street Station of the Caledonian Railway Company, visitors alighted at the Commissioners' private station in part of the administrative block of buildings comprising the timekeeping and pay offices on the platform level with general stores above, and then ascended the stairs communicating with the footbridge spanning the eight lines of railway where the traffic from the two railway systems and the Granton Harbour converge, and is distributed to its various lines of sidings.

COAL UNLOADING AND DELIVERY PLANT.

After crossing the bridge, the party descended to the yard level, moving in a southerly direction, passing the south end elevations of the buildings forming sections Nos. 1 and 2 of the works. As only the latter was in full operation, the inspection was confined to this division, commencing at the point where the loaded coal waggons are discharged by the upending of them. This is brought about by the rising of a hydraulic ram sunk between the rails, the fork of which catches under and raises the back axle of the waggon, the end door of which being released, the entire contents are precipitated into the shallow hopper beneath the rails. When bottom door waggons are employed, of which there are few in Scotland, upending is not necessary. The bottom of the hopper is made to travel at varying rates of speed, by which means the contents are projected forward to one of two breakers, where the coal is dealt with by heavy breakers with rotating toothed rolls in three tiers. The upper tier is of large dimensions, to take the largest pieces of coal or cannel, the smaller material falling between them; the medium tier is for reducing the coal to moderate size, the small still passing through; and, finally, there is a double tier of rolls with projecting teeth for bringing the coal down to the right size for carbonizing. The breakers, as already explained, are in duplicate, and are each capable of breaking 125 tons of coal per hour. From the base of the breaker, continuous bucket elevators remove the coal, and raise it to an elevation of 93 feet on the transverse central line of the retort-house. At the point of discharge, horizontal push-plate conveyors transmit the coal to one or more of four longitudinal conveyors of like character, over the four lines of bunkers supported upon the superstructure of the retort-bench, the contents of which are equal to 16 hours' work. Beneath these bunkers are fixed the measuring chambers for determining the charge, the top and bottom slides of which are actuated by a small hydraulic piston and cylinder. Portable adjustable shoots, running on rails in front of the mouthpieces, are employed to direct the contents of the chambers into the particular retort to be charged.

RETORT-SETTINGS AND ACCESSORIES.

The retorts are 22½ in. by 15½ in. in section and 20 feet long, in settings of nine per bed, having a gas take-off pipe at the lower mouthpiece only. The removal of the spent charge is effected principally by gravity through portable shoots (which act as shields to protect the operatives) running on rails immediately over the coke-conveyor. The coal-stopper used to prevent the charge descending upon the iron mouthpieces is withdrawn from the retort, and rests upon the travelling shoot ready for being returned to the retort. The retort contents are then allowed to flow through the shoots into the conveyor beneath. The red-hot coke is carried by means of a drag-chain conveyor to the north end of the retort-house before any water is applied; the quenching arrangement being semi-automatic. At this point the conveyor is enclosed, and an iron shaft 75 ft. 6 in. long rises from the top and discharges under the retort-house roof, by which means the men are freed from the annoyance and inconvenience of the steam, and the building is protected from the destroying action of the acid vapours resulting from the quenching of coke. From the end of the retort-house the conveyor trough rises in an inclined plane at an angle of 30°, and at a suitable point is made to discharge over jigger screens and into railway waggons ready for transport; the dust or breeze falling through the screens being accumulated in the hopper beneath, from which point it is transported on a narrow-gauge railway to the steam-boilers. Arrangements can be made in the coke-handling plant for storing a quantity in bunkers, as well as for automatically stacking it at a depth of 25 feet in the open yard.

INSTALLATION OF VERTICAL RETORTS.

Returning from the coke yard, the party passed along the producer furnace clinkering-floor, which is on the yard level, in order to take up again the course of the flow of gas. This enabled a thorough inspection to be made of the small vertical retort installation which has been at work for about four months. This plant has been erected in order to gain experience of its adaptability for the special purposes of the locality and the coal available. The setting has been designed in such a way that it could be used on the intermittent, or Dessau, system, and also on the continuous system, of charging and discharging. Since the commencement, it has been used on the latter system.

The retorts are 25 feet long, rectangular in section, measuring 20 in. by 48 in. at the bottom and 11 in. by 39 in. at the top. The setting is constructed so that the distribution of the fuel gas can be either continuous throughout the vertical length of the retort or from the upper end only. The retorts, six in number, are made of special grooved bricks, of which a small section was exhibited. The bench is built on exactly the same area as is occupied by one of the settings of inclined retorts, and is fired by gas produced in a separate generator; the intention being to extend the bench when necessary, so as to occupy the original foundations put in for the inclined retorts. The charging and discharging are done by rotating gas-tight valves having pockets sunk in the drum; and according to the speed at which they are rotated the carbonizing capacity is varied. The retorts are arranged in two groups of three in line, with a breeches spout, communicating with the coal-hopper above and with the coke-hoppers beneath, discharging into one central conveyor. As there is no commercial demand for coke in the locality, it was thought necessary that what was produced by the vertical retorts should be of a size suitable for the local market. The discharging arrangements were therefore in the nature of a breaker as well as a discharging device. Further particulars as to the installation were published in the "JOURNAL" for the 12th of April last (pp. 109-111).

Since the setting has been in operation, while the usual troubles incidental to putting new plant to work have not been wanting, they have been entirely of a mechanical character, brought about by the shafts and gear getting out of alignment, owing to their attachment to the buckstays supporting the bench moving slightly

with the expansion and contraction of the brickwork—difficulties which would not arise in an ordinary way in a large installation, as the temporary means of supporting its parts would not be followed. No difficulty has been experienced with the heating or charging and discharging devices; but considerable trouble has resulted from the installation of the special exhauster and means to isolate the gas from the works proper until after its measurement is accomplished.

Notwithstanding the fact that a large water-tube condenser is employed through which the gas is required to pass, it was found that the meter was frequently flooded with a thin fluid tar. The meter employed for measuring the gas was one of the air meters removed from another part of the works, and was in good condition when installed; but within a few weeks the drum was found to be perforated to an enormous extent, and has had to be renewed. It is not convenient, therefore, to give any long-period particulars of actual results. It appears, however, that the make per ton is greater by 15 per cent. without water added to the base for quenching purposes. The illuminating power of the gas is not higher than 14 candles, whereas 17 candles is obtained from the inclined retorts; and the calorific power is not inferior to the general installation. The carbonizing capacity of the retorts is at present 20 tons per day; but Mr. Herring does not consider that they have yet reached their full capacity. The installation has been run merely as part of the producing plant common to the section of the works in which it has been placed. Further particulars relating to it will be found in the "JOURNAL" for the 5th of April last (p. 33).

CONDENSERS, EXHAUSTERS, &c.

After completing the inspection of the vertical installation, the visitors proceeded along the stage floor of the retort-house and along the corridor over the tops of the water-tube condensers, which are beneath the floor of the gangway leading from the retort-house, to the workmen's messrooms and lavatories. Immediately following these are the exhausters, supported on a girder floor above the room within which is contained the main driving plant for the coal breakers, coal and coke elevators and conveyors, the hydraulic plant, and other subsidiary machinery; the whole of the retort-house plant and the coke-handling plant being driven from this source by means of a line-shaft extending in a trough under the retort-house floor. The main driving-engines have an electrically adjusted stop-valve and electrically connected pushes situated at various parts of the plant, including the conveyors from the roof of the retort-house to the coke-handling plant in the yard, so that in the event of a mishap of any kind occurring, the nearest operative depresses the button, which immediately effects the closing of the stop-valve of the driving-engine, and brings to a standstill the source of power, which if running for only a few moments would result in very much greater damage being done. This appliance has been found of great use. From the exhausters, the gas passes through the Pelouze and Audouin oil-extractors into the ammoniacal liquor washer, which is charged periodically with liquor from the well, previously cooled by passing through a water-cooled tower. From this point the gas goes into an ammoniacal liquor scrubber for the final elimination of this product, after which it is made to pass through a cyanide washer, and then flows on to the purifiers proper.

WORKSHOPS AND PURIFYING PLANT.

From this point the party proceeded to the north end of the works, passing under sections Nos. 1 and 2 of the coke-handling plant and through the mechanics' shops on their way to the purifying plant. The shops have been equipped in such a manner that the staff can deal with the repairs of the whole plant, of whatever character, on the works. Associated with the mechanics' shops are joiners' shops and the workmen's canteen.

On reaching the purifying-house, the visitors found the purifiers placed on a concrete foundation on the ground line, with a pipe-connection trough running centrally between two rows of boxes. The inner and outer connections of the purifiers are attached to the outside row of plates in each case; and the gas is distributed beneath the bottom layer of material in the purifier by means of iron perforated troughs. The purifiers are of the water-lute type; the covers being lifted in the usual way. The method of discharging is by means of transverse frames on which are attached four dredger elevators which discharge on to a belt running transversely with the line of boxes. The belt is reversible, so that in the days when lime was used it discharged its contents into railway waggons on a low-level siding on either side of the purifying plant, but now it is discharged into the boot of a centrally traversing elevator, which lifts the material, and discharges it on the upper floor, where it is revivified and prepared for being put again into the boxes. The method of charging is by means of a canvas shoot with rope tackle attached to the lower mouth; the material being fed into the mouth of the spout, sunk in the floor.

STATION-METER HOUSE AND OFFICES.

The station-meter house adjoins the gasholder. As the telephone system is established throughout the works, the employees in one department can speak with those in another. The meter readings are hourly reported to the carbonizing foremen in the exhauster-house, where records are duly entered, together with the weight of coal used per hour and the production of gas per ton worked out, as well as other fundamental data which go to control the operations in the works. The technical office provides accommodation for the engineering and chemical staff, as well as for statistical clerks engaged in the work of the manufacturing department.

COST OF THE WORKS.

In the course of their inspection, the visitors were doubtless struck with the pleasing design of the works. But though this is so, it may be pointed out that they have not necessarily cost more than is ordinarily considered reasonable for constructions of this character. This matter is specially dealt with by Mr. Herring in his book on "The Granton Gas-Works: Their Design, Construction, and Equipment."* The total capital of the works as they stand, with a producing capacity of 15 million cubic feet per day (with the second section buildings completed, but only one-half equipped with plant), including products works, roads, railways, and main drainage system for the entire area, has amounted to £43,000 per million cubic feet of carbonizing capacity, or £430 per ton of coal carbonized. The average cost for the three years 1907 to 1909 for repairs, renewals, and maintenance of works, plant, and appliances, has amounted to 2·63 per cent. on the capital outlay—labour costing 1·52 per cent. and materials 1·11 per cent.

THE NEW WORKS AT PROVAN (GLASGOW).

These works, which are the latest and most modern ones of the Glasgow Corporation, were formally opened in September, 1904. They stand on a site approximately 123 acres in extent, and are conveniently situated for both railway and canal communication. The levels are somewhat irregular; but advantage has been taken of the difference to facilitate the transfer of materials—the coal, lime, &c., being received at the high level, and the coke, &c., sent away at the low level. The works were designed for four sections, each forming independent works capable of manufacturing 12 million cubic feet of gas per day, or a total of 48 million cubic feet. At present only the first section has been constructed; but offices and workshops have been erected for the complete works. Ample railway siding accommodation has been provided; and both the standard gauge (4 ft. 8½ in.) and a narrow gauge (2 ft. 6 in.) of rails are laid throughout the works. After passing the entrance gateway, the visitors saw on the right-hand side the offices, workmen's bath-rooms, with dining-hall above, workshops, and the small locomotive shed; on the left being the governor, meter, exhauster, and boiler houses.

RETORT-HOUSES AND COAL-STORES.

There are two retort-houses, each 390 feet long and 78 feet wide, and each containing 720 fire-clay retorts, built in regenerative settings of twelves. The retorts are 23-inch by 16-inch, ⌂ shaped, and 9 feet long over all. The fuel gas by which the retorts are heated is generated in large gas-producers placed outside the retort-houses; the gas being conveyed to the settings through steel mains lined with fire-brick. Dampers are provided to regulate the supply of gas to each setting of retorts. The charging and drawing machines are of the Arrol-Foulis type, worked at a hydraulic pressure of 500 lbs. per square inch.

As the coke is drawn from the retorts, it falls through openings in the retort-house floor into steel waggons, which are drawn out by small locomotives and conveyed to the plant for storing, screening, and loading. A proportion of the coke direct from the retorts, without being quenched, is taken in hopper waggons to the gas-producers. The hot coke in the waggons is first taken to the quenching-house and then emptied into the sunk hoppers, which supply the gravity bucket conveyors. These conveyors elevate the coke on to high-level gantries, which are erected over the coke yard, and the coke is either dropped into stock or conveyed to the extreme end of the gantry, where the screening machinery is placed. This machinery separates the coke into various sizes, and loads it into carts or railway waggons. The coke is taken from stock by means of steam-cranes, equipped with grabs, which travel on the top of the gantries and discharge the coke into the conveyors as required.

The coal-stores have a capacity of 50,000 tons. The railway waggons containing the coal are run on to platforms 17 feet above the floor level; and, if required, they are emptied by hand into the store. For daily use, the waggons are run on to tipping platforms at the end of the stores, over the storage hoppers, which supply the coal-breakers, and are there emptied by the platform and waggon being tipped by hydraulic power to such an angle that the coal falls into the hoppers. Hydraulic capstans are provided for moving the waggons. The supply of coal from the hoppers to the breakers is governed by hydraulic-driven regulating drums, which ensure a constant supply equal to the capacity of the elevating and conveying plant. The broken coal is delivered into high storage hoppers by means of elevators and a system of gravity bucket conveyors. The supply of coal for the charging-machines is taken from these high storage hoppers.

CONDENSING, EXHAUSTING, AND PURIFYING PLANT.

The condensers are of both the atmospheric and water-tube type. The former are constructed of 18-inch steel tubes, and the latter are four in number, made by Messrs. Kirkham, Hulett, and Chandler, Limited. Each is able to deal with 3 million cubic feet of gas per 24 hours. There are eight of Waller's patent exhausters, in four sets of two, each set being driven by a vertical steam-engine. Each exhauster is capable of passing 120,000 cubic

* Published at the offices of the "JOURNAL."

feet of gas per hour. Four C. & W. Walker ammonia scrubbers have been erected, each machine being capable of dealing with 3 million cubic feet of gas in 24 hours; also two Holmes's rotary brush scrubbers for cyanide. The purifier-house is 503 feet long by 85 feet wide, and contains 24 purifiers in six sets of four. They are each 38 feet long, 27 feet wide, and 5 ft. 5½ in. deep. Lime is used exclusively, and is fed into the purifiers from an overhead gangway through canvas shoots. The spent lime is discharged through plugs in the bottom of the purifiers into waggons on the narrow-gauge railway beneath.

STATION METERS, GASHOLDERS, AND GOVERNORS.

Three station meters have been erected, each capable of passing 200,000 cubic feet of gas per hour. There are two three-lift gasholders of the same dimensions; the capacity of each being 8½ million cubic feet. The outer lift is 280 feet diameter and 50 feet deep, the middle lift 276 ft. 10½ in. diameter and 50 feet deep, and the inner lift 273 ft. 9 in. diameter and 51 feet deep. The tanks are of brick, 284 feet diameter and 51 feet deep. Within the governor-house are installed two Parsons turbo-exhausters. These are used to send the gas down through a high-pressure main to the gasholders at the Dalmarnock station. Each of the exhausters is capable of dealing with 780,000 cubic feet of gas per hour, working with a difference of pressure between the inlet and outlet of 24 inches of water.

THE TRADESTON WORKS.

These works, which are situated on the south side of Glasgow, cover an area of about 15½ acres, and are divided by the main line of the Caledonian Railway. Their present productive power is 10 million cubic feet per day; the storage capacity of the four gasholders is 7,350,000 cubic feet; the maximum make of gas in 24 hours is 9,393,000 cubic feet; and the total number of retorts is 1232. The works (formerly belonging to the Glasgow Gaslight Company) were built in 1838. In 1869, their productive capacity was 1½ million cubic feet per day, and in 1888 the production had increased to 4½ million cubic feet. In that year, a reconstruction of the works was carried out, extending them to their present capacity.

RETORT-HOUSE AND COAL-STORE.

These form a block measuring 301 feet long and 322 feet wide. There are four retort-benches set parallel with each other. Two benches have sixteen through ovens of eights, and the other two have fifteen of twelves. The retorts are all the same size—viz., 21 in. by 15 in. ⌂ shaped, and 9 feet long, set back to back, and heated on the regenerative system by semi-internal gas-producers. A complete installation of Arrol-Foulis charging and drawing machinery, worked by hydraulic pressure of 450 lbs. per square inch, is fitted to all the benches. The coal-store has a capacity of upwards of 14,000 tons, and has three lines of elevated railway with crossovers, three hydraulic capstans, and nine twin-ram tipping-machines. Bucket elevators, worked by the same steam-engines as drive the coal breakers, raise the broken coal to the storage hoppers, from which the charging-machines draw their supplies as required. As the coke is drawn from the retorts it is diverted into the producers, or sent down iron shoots, placed immediately in front of the retorts, into iron side-tipping waggons drawn by small locomotives running on a 2-feet gauge of rails. The coke is afterwards quenched in the yard, and lifted by means of grabs worked by travelling steam-cranes on the gantries.

CONDENSING, EXHAUSTING, AND PURIFYING PLANT.

The condensers are of the atmospheric type, formed of cast-iron pipes arranged vertically. There are twelve sections of 9-inch and eight sections of 12-inch pipes. There are four sets of two exhausters, each set being driven by a vertical steam-engine placed between them. Each exhauster is capable of passing 100,000 cubic feet of gas per hour. There are four ammonia scrubbers, each capable of dealing with 2½ million cubic feet of gas per 24 hours. The purifier shed is 350 feet long and 100 feet wide, in two spans, and contains four sets of purifiers, each set consisting of four cast-iron boxes, 35 feet square. There is a line of railway along each side for the lime waggons. Lime is the purifying agent; and it is burnt in the lime-kilns within the works. The spent lime is removed in waggons and carts to the country.

STATION METERS, GASHOLDERS, AND GOVERNORS.

The station-meter house is 107 feet long and 34 feet wide, and contains four station meters each capable of registering 120,000 cubic feet of gas per hour. Within it are the air-vessels, registers, and gauges in connection with the governors, which are placed underground, and connected to the trunk mains at the most convenient positions. There are seven mains leaving the works, varying in size from 18 to 30 inches diameter. There are four gasholders of a combined capacity of 7,350,000 cubic feet.

The annual general meeting of the Gas Companies' Protection Association will be held on Monday, the 24th inst., at the Westminster Palace Hotel.

Alderman Thomas Robert Gainsford, of Woodthorpe Hall, Sheffield, for many years Chairman of the Water Committee of the Sheffield Corporation and of the Derwent Valley Water Board, who died on the 3rd of July, aged 65, left estate of the gross value of £18,407, with net personalty amounting to £10,835.

OBITUARY.

The death occurred on Monday last week, at the age of 83, of Mr. GEORGE FIELDING, who had for sixty years practised as a Solicitor in Dover, and had for upwards of half-a-century been the Secretary of the Gas Company. Deceased was for many years District Registrar of the High Court and Registrar of the Dover County Court and of the Harbour Board, was Mayor in 1877, and was a Magistrate for the borough. He was a lineal descendant of Henry Fielding, the novelist. He will long be remembered in Dover for his generous benefactions. The late Mr. Fielding was a widower; and he is survived by a family of nine children.

Up till seven years ago, the name of Mr. ALFRED BONHAM-CARTER frequently appeared in our reports of parliamentary inquiries, from the fact that he was the Referee of Private Bills in the House of Commons. He retired in 1903; and he died on the 2nd inst., in his 86th year. Deceased, who was educated at University College, London, was appointed a Committee clerk in the House of Commons in 1854, and four years later was called to the Bar at the Inner Temple. From 1859 to 1866, he was Private Secretary to the then First Commissioner of Works, and afterwards became Referee of Private Bills. His long experience of close upon fifty years in the service of the House of Commons made him a great authority on parliamentary practice. He joined Sir Reginald Palgrave in editing the tenth edition of "May's Parliamentary Practice." He was made a C.B. in 1900.

PERSONAL.

Mr. E. C. FIELDING, second son of the late Mr. George Fielding, of Dover, whose recent death is announced above, has succeeded his father as Secretary of the Dover Gas Company.

As will be seen from the report which appears on another page, it was stated at the meeting of the Midland Junior Gas Engineering Association on Saturday that Mr. R. WARDELL is leaving the Birmingham Corporation Gas Department, having been appointed Assistant to the Engineer of the Cambridge Gas Company.

It may be remembered that the death of Alderman T. R. Gainsford caused a vacancy on the Derwent Valley Water Board, of which he was Chairman. The Sheffield Corporation have now selected Alderman C. F. BENNETT as their representative; and the Board have unanimously chosen Alderman Sir EDWARD H. FRASER (Nottingham) as Chairman, and Alderman W. W. VINCENT (Leicester) as Deputy-Chairman.

Mr. ALEC. E. WHITCHER, Assistant to Mr. W. H. Ely, Resident Engineer and Manager of the Woking Gas Company, Limited, has just been appointed as Manager to the Mersea and District Gas Company, Limited, and will superintend the erection of the works and the laying of some five miles of new mains. He is not yet 24 years of age, and was trained at Gosport. The Company are acquiring powers for the supply of water; and Mr. Whitcher will also be their Water Engineer.

The City Council of Newcastle-upon-Tyne last Wednesday resolved to re-nominate Sir WILLIAM HASWELL STEPHENSON, the Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, for the office of Lord Mayor for the ensuing year. At a special meeting held on the same day, it was unanimously resolved to confer upon Sir William the Honorary Freedom of the city, in recognition of the numerous liberal benefactions and other eminent and meritorious services rendered by him during his public career of more than forty years as a member of the City Council. Sir William has given to the city three public libraries (Elswick, Heaton, and Walker), and a statue of Queen Victoria. He has been Mayor four times. His latest act of generosity is a gift of a new Sunday School in connection with the Wesleyan Church at Elswick, at a cost of £575.

Mr. A. I. EASTWOOD, who is under Mr. J. H. Crowther, the Engineer and Manager of the Wallasey Corporation Gas and Water Departments, has been successful, out of about seventy applicants, in securing the position of Assistant-Manager to the Matlock and District Gas Company (rendered vacant by the appointment of Mr. J. W. Brown to the position of Manager of the Chapel-en-le-Frith, Chinley, and District Gas Company). Mr. Eastwood served his articles under Mr. Crowther at the Wallasey works, and has been through the various shops, laboratory, and drawing office, during which time, owing to extensive additions to the works, he has been able to take an active part and interest in such extensions. He is the holder of first-class certificates of the City and Guilds of London Institute in both the ordinary and honours grades of "Gas Engineering" and "Gas Supply," in addition to a number of certificates in other technical subjects—studied at the Liverpool Technical School. Mr. Eastwood is a member of the Manchester District Junior Gas Association.

We learn that Mr. G. W. G. TATAM, who is engaged with the Chattanooga Gas Company (Tenn.) as Superintendent of Distribution, is returning to England on vacation. He has recently completed large main extensions to new territory of the Company. Before leaving England, Mr. Tatam was engaged on the Chemical Staff of the Gaslight and Coke Company at their Nine Elms

Works, and subsequently under Mr. Henry Hack, as Works Chemist and Superintendent of the Coal-Testing Plant, at the Birmingham Corporation Gas-Works. He was lecturer in "Gas Manufacture" to the Birmingham Technical Education Committee; and is, of course, a Past-President of the Midland Junior Gas Engineering Association. After short service in the Testing Department of the Postal Telegraphs in London, Mr. Tatam was, in 1907, appointed Gas Engineering Expert to the Pawtucket Gas Company (R.I.), where he undertook the extension and reconstruction of works and district mains, including the foundations for a million cubic feet gasholder in steel tank, and the laying of low-pressure and high-pressure mains.

THE ST. GILLES (BRUSSELS) GAS-WORKS.

It will probably be remembered that, in connection with the visit of members of the Institution of Gas Engineers and of the Société Technique du Gaz en France to Brussels last June, we gave some particulars of the Municipal Gas-Works, the Forest station of the Imperial Continental Gas Association, and the works of the St. Josse-ten-Noode Gas Company at Jette St. Pierre.* We are now in a position, from the "Transactions" of the Belgian Association of Gas Managers for the year 1909-10, recently received from the Secretary (M. Emile van Heede), and already acknowledged, to supplement the previous details by others relating to the gas-works which supply the commune of St. Gilles.

The works are situated on the communal land at Anderlecht, between the Senne and the Charleroi Canal. In front of them the canal has been widened, so that a dock has been formed, where the unloading of the water-borne coal can be carried on. The plant consists of a grab crane connected with the coal-store on the works by an automatic railway. The works are also connected, by means of a bridge thrown across the Senne, with a broad cart road, and by a siding with the Forest Station of the Brussels-Calais line. The network of lines on the works has been arranged to convey the raw material to the point of utilization and to remove the products.

Up to the year 1908, only coal gas was made; but plant for the production of carburetted water gas has since been installed. These gases are manufactured in separate works. Those for making coal gas consist of a retort-house and coal-store (with an annex containing the smithy, the repairing-shop, and the men's mess and bath rooms, &c.), the engine and boiler house, purifier and station-meter houses, and the building containing the sulphate of ammonia plant. The coal-store has a capacity of 4000 tons. The coal arriving by rail is conveyed into the store by an overhead railway; that coming by water is unloaded by the grab crane, transferred into hoppers, and from them deposited in special trucks running upon an incline in the direction of the store. The discharge of the coal at any given point is arranged by suitable mechanism. On each journey the truck is weighed and the weight duly registered. The retort-house contains four benches of five Klönne generator settings of nine horizontal retorts 10 feet long, charged by scoops supported by a rackwork which enables them to be raised to any height desired. By this arrangement the work of the stokers is considerably lightened, and the time required for charging the retorts is reduced to a minimum. Discharging is done by hand, in the usual way. The hot coke falls through openings in the charging-stage into trucks running on the floor below, which is on a level with the yard, where it is quenched, and either stacked or conveyed to the breaker. At the time of the preparation of these particulars, the third bench of horizontal retorts was being replaced by a setting of five horizontal carbonizing chambers having a total productive capacity of rather more than 700,000 cubic feet per day.

On leaving the hydraulic mains, the gas passes into a condenser of large volume; the principle adopted being to cool the gas in a single appliance in which the gaseous current ascends slowly. It consists of a steel cylinder 10 feet in diameter and about 65 feet high. The gas enters the vessel at a temperature of 140° Fahr., and leaves it at about 70°. In winter, when the outside temperature is too low, a second inlet, situated at about the middle of the apparatus, allows of the upper half only being used. After passing through the condenser, the gas is conveyed by an above-ground pipe to the exhausters, of which there are two (Beale's three-blade type), each worked by an independent steam-engine. It then goes through a Pelouze and Audouin apparatus, which takes out the remaining tar, is afterwards cooled by water-tube condensers, and finally passes through two "Standard" washers. The tar and ammoniacal liquor resulting from these operations first flow into one vessel, in which they are separated, and are subsequently conveyed into special tanks. The purifier-house contains six purifiers, constituting two groups of three in series. The material is divided into three layers, and the gas can be made to pass through one, two, or all of them, as may be desired. In this way the greatest amount of work is obtained from the material before revivification becomes necessary. A small quantity of air is mixed with the gas before it goes into the purifiers; so that, in a measure, the material is revivified *in situ*. The station-meter house contains, in addition to the meter, the various pressure regulators and a steam-engine working the washers and the water, tar, and liquor pumps. The liquor is converted into sulphate of ammonia on the premises.

The carburetted water gas is manufactured, as already mentioned, in entirely separate works. The machine-room contains two Laval blowers of 15-H.P. capacity, running at the rate of 24,000 revolutions per minute. Each works a fan furnishing the air necessary for supplying the apparatus during the period of the "blow." Two Beale exhausters, each driven by an independent steam-engine, are provided. The producing plant consists of two sets of Humphreys and Glasgow's apparatus, each having a capacity of 600,000 cubic feet per day. There are four purifiers, arranged in one block, furnished with Milbourne valves (two in each box), Spencer's hurdle grids, and dry lutes. By the side of the purifiers is the revivifying shed. In the meter-house, which adjoins the purifier-house, is a Pelouze and Audouin tar-extractor constructed specially for carburetted water gas. After purification, the gas is passed through a "Duplex" meter. The installation of water-gas plant is completed by a gasholder of 35,000 cubic feet capacity in a steel tank, an oil reservoir, also of steel, holding about 50,000 gallons, and a tar and liquor separator.

On issuing from their respective meters, the coal gas and carburetted water gas are mixed, and stored in two gasholders, each of about 536,000 cubic feet capacity. Between the two holders is a boiler for producing steam for heating the hydraulic seals in winter.

The laboratory contains all the usual apparatus. In the photometer-room there is a Dumas and Regnault photometer; also one of the Bunsen type with the Hefner standard. The determinations of the illuminating power of the gas are made with a "Metropolitan" No. 2 burner; but this is only done by way of check, as the working is regulated for the production of a mixed gas having a practically constant calorific power, as tested by the Junkers calorimeter.

* See "Journal," Vol. CX., p. 941 and Vol. CXI., pp. 23, 112, 113.

The Dessau Vertical Retort Installation at Amsterdam.

We last week made brief reference to an order just placed with the Dessau Vertical Retort Company for a large installation of retorts to form the entire carbonizing plant of the new Southern Works of the Amsterdam Municipality. We understand that the order is a record one for verticals, comprising as it does 540 retorts with a producing capacity of about 6 million cubic feet of gas per diem. The Contractors are the Stettiner-Chamotte Fabrik, with whom the firm of Messrs. S. Cutler and Sons, of Millwall and Westminster, will be associated in regard to the steel constructional work and various other parts of this important installation. The decision to adopt the Dessau system was come to upon the recommendation of the Chief Director of the Gas Administration, Herr van Rossum du Chattel, who made a very exhaustive investigation of all carbonizing systems that are at present available.

Retort-House for Genoa with Fiddes-Aldridge Machinery.

The Union des Gaz have recently let a contract for the construction of a new retort-house to contain ten beds each of ten horizontal retorts at the Gavette station in Genoa. The Company have placed the order with Messrs. Aldridge and Ranken, for two of their five-tier stoking machines; and Messrs. Cutler and Sons, of Millwall and Westminster, are associated with the Paris firm of Messrs. Picard in regard to the supply of the coal and coke handling plants and other steel constructional work. Messrs. Cutler and Sons are sole agents in Italy for the Fiddes-Aldridge machinery and plant, which has already been installed at the Turin (Consumatori) and Como Gas-Works, and is giving satisfactory results. The firm also have the agency for the plant in Holland, where it is being installed at the Deventer Gas-Works together with coke handling and distributing plant. The Rotterdam Gas-Works have installed the second machine of this type.

Scraping Water-Mains.—The scraping of water-mains at Dundalk, Ireland, is accomplished both by hand and by pressure-driven tools. The hand method is used on pipes of from 3 to 5 inches diameter; a 5-feet length being cut out of the line and scrapers fixed to the ends of stout cane rods inserted in each direction. During the operations, water is allowed to run freely from the pipe. Two types of tool are used on the hand work—a round, chisel-pointed bar with a bow spring on one side, made to fit the circumference of the pipe, or a spring steel coil fitted on a ¾-inch round bar centre. Mr. M. Sellars, the Town Surveyor, who presented a paper upon this subject recently before the Incorporated Association of Municipal and County Engineers at Dublin, does not recommend the drawing of scrapers by chains and windlasses. Hand scraping on 3-inch mains is said to have cost from 2½d. to 3d. per lineal yard. The pressure-driven scraper used is fitted with adjustable blades and with a swivel joint between the sets of knives, to facilitate travel round corners. The head necessary to drive a 5-inch scraper is 60 feet. It is desirable, however, to have an available static pressure of 80 to 150 feet for pipes ranging from 12 to 5 inches diameter. The proper rate at which to drive the scraper is given as 4 feet per hour.

RETORTS AND GAS-METERS.

The report in the "JOURNAL" for June 28 last (p. 945) of the proceedings at the meeting of the German Association of Gas and Water Engineers at Königsberg contained a summary of the contents of a paper read by Herr Kobbert, the Manager of the Königsberg gas undertaking, on "Retorts and Gas-Meters." The paper was not at the time available for translation *in extenso;* but the full text of it has been published in a recent number of the "Journal für Gasbeleuchtung," from which the following more detailed abstract translation has been prepared.

The discussion of economical questions relating to gas-works has in the past year or two come much into the forefront. The last twenty years have constituted a period of development extremely interesting from the technical side and industrially of great consequence. It was humorously said at the last meeting of the German Association that gas manufacture had in this time entirely changed its face. The first fifteen of these twenty years were marked chiefly by the development of mechanical appliances in gas-works. Subsequently carbonizing plant took the foremost place, and doubtless the third and ensuing period will be distinguished as that of the chemistry of the bye-products of gas manufacture. The introduction of incandescent lighting and the consequent increase in the output of gas were contemporaneous with the introduction of inclined retorts, and the latter necessarily involved the use of mechanical means of conveying coal in the retort-house at least. The mechanical transport of materials in bulk was at the same time being much exploited in Germany, and gas-works presented an inviting field for its application. As a result, the immense number of workmen employed on gas-works was considerably reduced, when the works were extended or renewed. The gain thereby secured was, however, in part balanced by the increasing charges involved in the rising social requirements. It is unnecessary for the author to refer in detail to the gains attributed to the mechanical transport of coal and the introduction of machinery into the retort-house.

Naturally, the first point considered has been how much is the saving of wages secured by such installations? The consumption of power and the expenditure on wages can be fairly easily computed beforehand, and both are so much lower with modern conveying plant than with manual labour that the value of the plant may easily be overrated. For instance, at the old gas-works at Königsberg the bringing of coal into store by the primitive plant there available cost about 1s. 1d. per ton, and into the retort-house a total of about 1s. 4d. per ton. At the present time, at the new works the cost of current and wages, including all subsidiary charges for bringing coal into store, is about 4d. per ton (taking the cost of current at 3½d. per Board of Trade unit), notwithstanding that rates of wages have generally increased and incidental expenditure has been incurred to meet modern social demands. Naturally, this comparison does not illustrate the real value of the mechanical transport of coal. The interest on the capital expenditure for conveying plant to deal with a supply of about 60,000 tons of coal per annum amounts to about 6d. per ton; and to this must be added the necessary allowance for depreciation. The proper allowance under this head has been more fully dealt with in a paper by Herr Kordt, of Düsseldorf.* But in regard to this question, it may be observed that it is quite unjustifiable to take depreciation charges on modern mechanical plant on a gas-works on the common basis of a life of 35 to 50 or more years. Even if maintenance charges could be precisely calculated and allowed for over such a period, regard must be paid to the rapid change in technical equipment, which the lessons of the last three decades indicate will be out-of-date and superseded by new apparatus within a comparatively short time. The conclusion is thus forced on one that the allowance for depreciation can scarcely be made too high.

In the instance quoted—viz., conveying plant to deal with some 60,000 tons of coal per annum—if the allowance for depreciation is taken at the rate of 2 per cent. on the pile foundations, on the machinery at 10 per cent., and on the constructional ironwork at 5 per cent., the depreciation charges would average 6d. per ton of coal. Thus the total charges for the mechanical conveying of the coal would apparently be quite as high as for the former hand work. If the conditions had otherwise remained unaltered, the transition to mechanical working would not be justified. But mechanical plant reduces the time required for discharging a steamer, and does away therefore with the necessity for discharging the latter in the first instance into lighters. Thus about 1s. 2½d. per ton, the cost of lighterage, is saved. The rapid discharge of the steamers brings with it other advantages the exact value of which cannot be put into figures, but which are very real. The price of coal in the old conditions rose at the time when it was dearest (in 1900) to about 23s. per ton; whereas in the similar time in 1908 it only reached 18s. per ton. It has to be considered in this connection that a charge of 1s. 4d. for wages involves a higher commercial risk than an expenditure of 1s. 4d., of which 4d. is for wages and current, and 1s. for interest and depreciation charges. The 1s. in the latter case is fixed, and only the 4d. is liable to vary; whereas in the former case the whole charge of 1s. 4d. is subject to the tendency of wages to rise rapidly, and of attendant social burdens to increase. It will be seen that considerable technical advantages in working may be completely balanced by the indirect expenses which too large capital outlay or too small utilization of plant may entail.

In regard to the first stage of gas manufacture—viz., the transport of coal—the relationship between technical methods and economy can tolerably easily be observed. But when we pass on to carbonization, or the relation between technical methods and economy in respect of the retorts or carbonizing plant, a much more complicated problem is at once presented. The work done by mechanical plant can be measured, and thereby clearly ascertained; but the work of carbonization cannot always be ascertained clearly at the time. The work of carbonization is measured by the heat practically required in given conditions for the carbonization of a ton of coal. In the second place, however, the result attainable in yield of gas by the carbonization of a ton of any coal has not been properly established. The chemist may report the quantity of volatile constituents in the coal; but he cannot predict therefrom what proportion will be recovered in the form of gas and what proportion as liquid bye-products. A reliable criterion of technical utility—viz., the determination of the degree of efficiency—which is available in regard to mechanical and electrical plant, is thus lacking in regard to carbonization. Consequently, any judgment of settings and their duty is still based on purely empirical impressions. We must, therefore, take care in drawing conclusions from our practical and commercial results that we are not basing them on fallacies.

This defect makes it very difficult to compare different types of settings. It does not follow that because a certain proportion of fuel gives a satisfactory output from a setting that another setting is consuming too large a quantity of fuel. The figures for the two settings would be comparable only if it had been ascertained what was the ratio of the fuel consumed at any time to the heat actually required for the carbonization of the coal. It is well known that this ratio varies very considerably with the same description of coal according to the weight of a cubic yard of the coal as charged into the retorts, and according to other conditions which are not affected by the setting. The carbonization of coal nominally of the same kind often shows very different results in respect of the duty of the setting in different cases. Until the work required for the carbonization is known, we can only form a correct judgment on the work of settings by eliminating the smaller working differences—that is to say, the working results must be taken for a tolerably long period of observation in order to ascertain whether two types of settings working in presumably the same conditions have yielded the same quantity of heat from a given quantity of coal. At Königsberg, the heat expended in fuel and the heat obtained in the gas from the carbonizing chambers is now being checked over a period of four weeks. Formerly at least eight days were taken as the minimum time for checking the performances of the retort-settings.

It must be remembered that the settings store up a great deal of heat, and by suitable preparation they can give an extremely high duty for 24 to 50 hours with a very small consumption of fuel. The author, unfortunately, at the time is unable to give the working results for the chamber settings at Königsberg, because the four weeks' trial only terminates on the day on which this paper is read. The conditions of the contract for the erection of the chamber settings, however, included a guarantee that coal containing about 1·55 per cent. of moisture and 9 per cent. of ash, and yielding 26·9 per cent. of volatile constituents, should afford 6,894,720 B.Th.U. gross heating value in the total volume of gas produced from a ton of coal. The coal in question when in the steamers must not contain more than 15 per cent. of breeze which will pass through a screen of 0·16 inch mesh. This result must be attained, according to the guarantee, with a consumption of not more than 16·5 lbs. of dry coke, as obtained from the same coal in the chamber settings, per 100 lbs. of coal carbonized. Not more than six men are to be employed per 24 hours for the conveying of the coal, the removal of the coke, and firing the producers, &c. [A footnote states that in one trial 7,438,960 B.Th.U. were obtained in the gas made in the chambers from a ton of a particular coal which at the Carlsruhe Experimental Works yielded 7,502,750 B.Th.U. in the gas. The yield in the chambers was therefore more than 99 per cent. of the Experimental Works' result.

The working of the chambers has, however, shown that they behave in regard to the production of coke, tar, and naphthalene in the manner in which carbonizing plant which is completely filled by the charge and presents no superheating surfaces to the crude gas behaves. The settings are very readily regulated and fulfil all working requirements. The temperature of the chambers is about 1000° C. A shift of six men works from 6 o'clock in the morning till 5 o'clock in the afternoon, with an interval of three hours. At night, two men are left to watch the working of the settings. In the early part of the first four weeks, five settings were in use, and latterly only four. These produced the whole of the coal gas required for distribution. One-half the chambers were charged at the commencement and half towards the end of the working shift. As a rule, the carbonizing time was 24 hours; but when the output of gas had to be reduced, it was extended to 36 to 48 hours. The calorific value of the gas as recorded by a registering calorimeter ranges from 395 to 675 B.Th.U. per cubic feet, with two peaks. The calorific power of the gas distributed is, however, nearly uniform; and no difficulty has been experienced in maintaining it to the desired standard of calorific power. The

* See "JOURNAL," Vol. CXI., p. 267.

coke produced from coal of uniform size, and containing at the most 4 to 6 per cent. of breeze, slides out of the chamber when the block is lightly pushed. If the charge contains much breeze, more difficulty is experienced, and a push discharging machine becomes necessary for the whole length of the chamber.

The expenditure on power and wages can naturally be as readily established for settings as for conveying plant; but a different value should be assigned to the labour according as one, two, or three shifts are required per 24 hours. The working advantages of a single shift are obvious; and it should also be borne in mind that sleep in the daytime in workmen's dwellings crowded with children and the subsequent nightwork are comparatively less valuable. The third factor in the determination of the value of settings is the allowance for interest and depreciation. Interest may be simply computed on the capital expenditure; but the depreciation allowance is more difficult to determine. On foundations 2 per cent. may be fairly applied, and on structural ironwork about 5 per cent. of the original cost should suffice. For the structure of the settings proper, the average allowance must depend on the difference in the life of the component parts of the settings. For the inclined-retort settings at Königsberg, 15 per cent. of their original cost was written off for depreciation. A high depreciation allowance has the advantage that there is less obstacle to the works being continuously kept up to date in equipment. In choosing a type of settings, not only the running maintenance work must be regarded, but also the renewal work which recurs periodically. It is a question for the book-keeper whether these periodical renewals are to be added to the value of the construction—a permissible course if the amounts written off for depreciation are sufficiently high—or whether they are to be booked as repairs and a more moderate allowance made for depreciation. With the 15 per cent. depreciation allowance at Königsberg, the renewals of the retorts have been booked as repairs; and this procedure seems in any case the soundest. As the retorts have had an average life of over 1600 days under fire, this allowance has been on the safe side.

Two examples may be given of the total cost of the output of settings. Two constructing firms—A and B—offer the following guarantees:

	A.		B.
(1) Yield of gas, cubic feet per ton	11,125	..	12,200
(2) Fuel consumption, per cent. by weight	16	..	12
(3) Daily make per shift per man, cubic feet	264,750	..	353,000
(4) Capital outlay per 1000 cubic feet of gas made per diem	£18 1s.	..	£20 17s.
(5) Life of the settings, days	1,000	..	1,000
(6) Cost of repairs per 1000 cubic feet of gas made per diem	7s. 6d.	..	£2 2s.
(7) Tons of coal carbonized per annum for a make of 35 million cubic feet	3,226	..	3,000
(8) Cost of coal per annum at 15s. per ton	£2,420	..	£2,250
(9) Value of coke used as fuel at 23s. per ton	594	..	414
(10) Wages at 4s. per man per shift	26	..	20
(11) Interest at 4 per cent.	71	..	82
(12) Depreciation, averaging 8 per cent.	143	..	164
(13) Repairs	40	..	225
	£3,294	..	£3,155
Deducting receipts for coke at 23s. per ton	£2,597	..	£2,415
Total cost =	£697	..	£740

It will be seen that quotation B presents, in regard to the coal carbonized and the coke used as fuel, an economy of £349; whereas quotation A affords in regard to the interest and depreciation charges an economy of £217. Thus dependent on the capital expenditure according to quotation A being less by £349, this quotation is ultimately more favourable by £43 for every 35 million cubic feet of gas made per annum. This illustration demonstrates that great economy in coal and coke consumption may be more than neutralized by the paramount effect of the interest and depreciation charges on capital expenditure. In regard to the fuel consumption, it may be pointed out that it may be computed according to one of three methods—viz.: (1) According to the number of the charges for the fuel consumption, after the yield of coke from the coal has been determined by crucible tests in the laboratory or the experimental gas-works; (2), by reference to the coke available for sale from the working of the settings; and (3), by the weight of coke used for fuel, allowing for the moisture it is found to contain on being tested in the laboratory. Differences of (say) 5 per cent. of the weight of coal can forthwith ensue according as one or other of these three methods is adopted in calculating the results. Hence the allowance for fuel consumption adopted in the foregoing comparison of the two quotations is valueless unless it is made in both cases on the same basis. Having regard to these considerations, the difference ultimately shown by the calculation has only a relatively small value. The capital expenditure is the predominant item in determining the choice of the type of setting, and compared with it the results for a 24 or 72 hours' carbonizing trial have a purely academical significance. There is one other point. While carbonizing plant for a make of 35,000 cubic feet per diem costs £650 to £750, water-gas plant of the same productive capacity costs only £300. Hence it would appear highly improbable that water gas can be produced more cheaply in coal-gas retorts or chambers than in water-gas generators.

Almost of equal importance with the handling of coal and the carbonizing, so far as the commercial results of gas undertakings are concerned, are the conditions of the sale of gas. The measurement of gas here becomes of pre-eminent consequence. Generally, the make at the gas-works is ascertained by standardized wet meters. So far as the control of the distributing system and of the output of gas to different parts of the district is concerned, this choice is justified; but in regard to the working results of the works, the ton of coal is more and more becoming recognized as the basis on which the results should be judged, just as is the case in coke-oven works. At Königsberg, for some years past a dry rotary meter has been used for part of the make. It occupies little space, and is simple. If used within a range of 10 per cent. above or below its normal capacity, its record is amply sufficient for controlling the make of gas from day to day. So far as distribution is concerned, the gas consumed for public lighting and the unaccounted-for gas are important items which bear a more or less definite ratio to the gas sold. The bearing of pressure ignition of street-lamps on the proportion of unaccounted-for gas is a question worthy of consideration. Whether the unaccounted-for gas has increased since the introduction of pressure ignition does not depend on the pressure itself or on the distributing system, supposing both are properly controlled and supervised, but rather on the method adopted for calculating the gas consumed for public lighting. The consumption under this head was formerly ascertained by assuming a certain average time during which the street-lamps were alight; but since the introduction of pressure iguition, this time is exactly known. Consequently, the figure for the unaccounted-for gas has gained considerably in exactness and in importance as a means for controlling the soundness of the distributing system.

Temperature variations and the errors of the meters have, however, still to be considered; and the author regards them as of more importance now than formerly. It was undoubtedly right, especially in the north, that dry meters should be preferred to wet. In Königsberg, dry meters of various patterns have been used exclusively for the last thirty years; but the superiority of the wet meter in regard to precision of measurement remains unchallenged. Meter manufacturers have, however, done everything possible to overcome the faults of the dry meter; and it is only its precision after it has been in use for some time that is in question. At the Königsberg Gas-Works, every consumer's meter which has been disconnected for any reason is forthwith proved again before it is re-connected in a new place; and the records of the proving of these meters show that it is desirable that a dry meter which has not been disconnected for any other reason should be removed for re-proving once in ten years at least, and, for choice, after it has been in use five years. Of 285 meters which were proved after they had been in use for over ten years, only 58 per cent registered within the permissible limits of error. Other tests of dry meters which had been in continuous use for from five to fifteen years showed a somewhat better, but still rather disconcerting, result, as 51 per cent. only of them registered within ± 2 per cent., of the correct quantity. The limit of error in respect of a further 36 per cent. was between ± 2 per cent. and ± 4 per cent. Of the meters which had been in use for nine years or more, 20 per cent. were outside the error permissible [in Germany] of ± 4 per cent. Having regard to these figures, gas undertakings are specially interested in the results of an attempt which is being made at Charlottenburg to use wet meters filled with a suitable oil. The effect of the price charged for gas on the output is a question which has been much discussed in recent years. At Königsberg, the average selling price of the gas sold for purposes other than public lighting has in ten years fallen from 4s. 3d. to 3s. 10d. per 1000 cubic feet.

The study of these questions presents many interesting points. If we attempt to investigate them from the reports of the gas undertakings without further information, we find that it is difficult to form definite conclusions, because the bases on which the balance-sheets and prime cost calculations of the different works are drawn up are not comparable. The author has made an attempt to compute the net profit for eleven gas undertakings for the year 1908, and sets out the results in tabular form. The net profit per 1000 cubic feet of the gas made, exclusive of street lighting, varies from 11·5d. to 1s. 5·7d.; while the amount written off for depreciation ranges from 0·76d. to 10·4d., making the profit (after writing off for depreciation) to vary from 7·3d. to 14·1d. The sums written off for depreciation vary from 5·13 per cent. to 58·65 per cent. of the net profit; leaving a residue equal to 41·35 per cent. to 94·87 per cent. If the highest depreciation allowance—viz., 10·4d. per 1000 cubic feet—is deducted from the profit in all cases, the net profit remaining varies between 1·09d. and 7·3d. per 1000 cubic feet. These figures demonstrate again the great importance of the allowances for depreciation in reckoning the economical and industrial results of gas-works.

The author does not pretend that his remarks have been in any way exhaustive; but he is forced to bring them to a conclusion and summarizes the points made as follows:

1.—The charges for interest, fair depreciation, and repairs may quite readily swallow up any advantage afforded by economies in other directions. The final and most important issue in the choice of settings or plant is therefore the cost of installation; and this for the same productive capacity frequently has nothing to do with the technical qualities of the plant.

2.—A proper computation and comparison of the cost of installation with different plant or types of setting is only possible when an actual definite determination of the efficiency has been carried out.

3.—Notwithstanding the perfection and great convenience of

dry gas-meters, the measurement of gas by wet meters must be regarded as less open to objection provided a liquid of constant volume which has no action on metals is used in the meters.

4.—A comparison of the economical results of different gas-works can only be based on the net profit, taking into consideration the average selling price of gas and the consumption for public lighting; and it is best carried out by drawing up a balance-sheet on the lines which would be followed in commercial as well as in municipal book-keeping.

5.—An endeavour should be made by gas-works to agree to a uniform scheme for reckoning prime cost, which should be independent of any mode of reckoning adopted by a works on its own account, and should afford a common basis for the exchange of opinions upon the important question of the industrial results attained by the works.

THE WASHER-COOLER AS A GAS-CONDENSER.

By Warren S. Blauvelt, of Detroit.

[A Paper prepared for the Michigan Gas Association.]

Three years ago, Mr. William Seymour presented to this Association an interesting and instructive paper, entitled "A New Method of Condensing and Scrubbing," in which he described the Doherty washer-cooler installed at Grand Rapids, and gave records of its performance."* It is the purpose of this paper to note some further developments in the type of apparatus described by Mr. Seymour; giving a description of the washer-coolers installed as coal-gas condensers by the Solvay Process Company at the Detroit coke-oven plant, and results of their operation.

The condensing apparatus in use at this plant prior to 1909 consisted of 16 tubular condensers, each 8 feet in diameter, and containing 187 tubes, 4 inches diameter and 18 feet long. The total tube cooling surface with these condensers was 56,400 square feet. The ground area required for the condensers and their connections approximated 1800 square feet. The cooling waters available at this plant come from two sources. River water in unlimited quantity may be had for the cost of pumping. In extremely hot weather, however, its temperature occasionally rises to 80° Fahr., and during two months in summer is seldom below 72° Fahr. About 150 gallons per minute of well water at 60° Fahr. are also available for gas condensation. With these supplies of cooling water, the old condensers were doing their utmost at Midsummer, when cooling daily 9 million cubic feet of gas, direct from the hydraulic mains, to about 80° Fahr.

When the decision was arrived at to raise the capacity of the plant to 1350 tons of coal coked daily (reaching this figure in September, 1910), it was evident that the capacity of the gas-condensing plant would have to be increased about 50 per cent. To have secured this additional capacity with tubular condensers would have required ground area in excess of that available, and would have involved a heavy investment in condensers and piping. The results obtained with an experimental Doherty washer-cooler, similar to the one described in Mr. Seymour's paper, had been so satisfactory that it was decided to secure the required condenser capacity by replacing the tubular condensers with washer-coolers. In order to keep down the cost, it was determined to use the old condenser shells for the new apparatus.

At this plant the gas leaving the ovens during the first part of the coking period is kept separate from that coming off later; thus requiring independent condensing and scrubbing systems for the rich and the lean gases. Though, from purely theoretical considerations, condensing in four or more stages is preferable, it was decided to do all the cooling in each system in two stages; thus greatly simplifying the plant and correspondingly reducing its cost. Four washer-cooler condensers were therefore installed; a primary and a secondary being supplied for both rich and lean gas systems. As the two condensing systems are exactly alike, one description will suffice for both.

The general arrangement of the condensing apparatus is shown in fig. 1. The gas comes from the hydraulic mains, through the foul main A, to the primary washer-cooler, which it enters at the nozzle B. A bye-pass C is provided, which may be used by withdrawing a slip blank at D and inserting slip blanks at E and H. The gas enters the space F, passing up through the narrow passages between the boards which comprise the grids G (shown in detail in fig. 2), where it is cooled and scrubbed by direct contact with weak ammoniacal liquor, which flows down over the surface of the grids. The gas leaves the primary cooler at the top nozzle H, and is conducted through the main A^1 to the secondary cooler, through which it passes in the same way.

At the bottom of the cooler is a liquor reservoir, J^1. This serves as a storage-tank for the circulating liquor and as a decanter for separating the tar, which is drawn off through the pipe O, extending to the bottom of the reservoir. As the quantity of liquor is constantly increased by condensation of vapour, a constant-level overflow N is provided, through which liquor equal in volume to the condensate flows continuously to the liquor reservoir in the secondary cooler. K is a baffle over which the liquor dropping from the grids flows to the side of the reservoir opposite the tar and liquor outlet-pipes. The circulating liquor is drawn off through the suction-pipe P to the centrifugal pump R, which delivers it to

* See "Journal," Vol. C., p. 99.

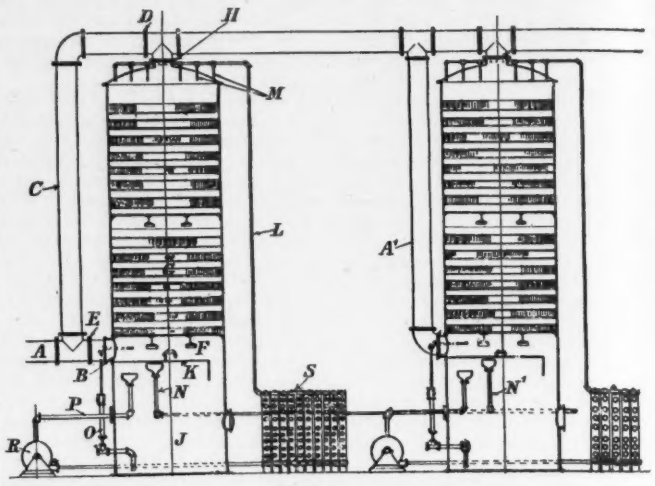


Fig. 1.

the cooling-coils S, whence it flows through the pipe L to the distributing-pipes M, which enter the top of the cooler, and discharge the cooled liquor over the grids through some suitable sprinkling nozzles. The circulation of liquor in the secondary washer-cooler is similar to that in the primary. As the heat transferred, however, is much less, a lower rate of flow and less cooling capacity are required. Through the constant-level overflow N^1 in the secondary cooler a quantity of liquor, equal to that condensed *plus* that fed to the apparatus from the primary cooler, flows to a weak liquor collecting-tank.

Two types of cooler (single pipe and double pipe) are used to cool the circulating liquor. The single-pipe coolers are stacks of 2-inch galvanized iron pipe, 11 pipes high. The hot liquor enters the bottom pipe, through which it flows, then through a return bend to the pipe above, &c., through the stack. Cooling water, properly distributed by a gutter, flows down over the outside surface of the pipes. The double-pipe coolers are made up of stacks of eight 2-inch pipes enclosed in 3-inch pipes; the 2-inch pipes in each stack being connected together in series by return bends. Special fittings are provided which connect in series the annular spaces between the different 2-inch and 3-inch pipes. The hot liquor enters the annular space at the bottom, flows through it, then to the one above, &c. Cooling water flows through the 2-inch pipe in the opposite direction. During the summer, cooling water is also used on the outside of the 3-inch pipes, in the same way as in the single-pipe coolers. The cooling-coils for the secondary circulation are placed directly over the primary cooling-coils; thus economizing space and making possible, without extra piping, the use on the primary coils of the cooling water from the secondary coils.

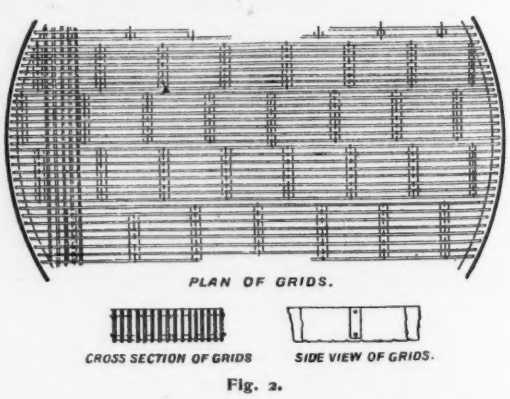


Fig. 2.

As temperature conditions during condensation are practically the same for both rich and lean gas, only two cooling and circulating systems are required for the four washer-coolers. A centrifugal pump is provided to maintain the circulation through each system. A third pump is installed in such a manner that it can handle either the primary or the secondary circulation.

The washer-coolers have been in continuous service since July, 1909. The only changes made since the original installation were the installation of a high-efficiency pump, to take the place of a low-efficiency one on the primary circulation, and the addition of seven stacks of double-pipe cooler. The addition to the cooling capacity was made in connection with an enlargement of plant, which increased the quantity of gas to be cooled daily by about 2 million cubic feet.

There has been no trouble on account of naphthalene stoppages in the apparatus. As naphthalene can collect in masses only on stationary surfaces, there can be no trouble from this source in an apparatus where all the surfaces are at all times covered with flowing liquor, which immediately carries away any particles of naph-

thalene which condense. There is a slight accumulation of it on the walls of the cooling-pipes through which the ammoniacal liquor circulates. This is very quickly removed by steaming out the coil. In order to maintain the cooling efficiency of the pipe coils, it has been found advisable to steam them out at intervals of about three months.

So far as observed, the rapid cooling has had no ill-effect upon the illuminating power of the gas; loss of candle power in condensation being due to the absorption of illuminants by tar. Such losses increase if the tar, after condensation, is allowed to remain in contact with the gas, and especially if the temperature of the tar is reduced before it is separated from the gas. In the washer-cooler, the tar flows down through the apparatus. As it descends with the liquor, its temperature is constantly raised, and its power to absorb illuminants greatly reduced. It is somewhat of a question also whether the tar, after condensation, ever comes in contact with the gas. It is probable that each particle is covered with water immediately after it has condensed.

Temperature observations, in degrees Fahrenheit, made July 21, 1910, are given below:—

—	Rich Gas.		Lean Gas.	
	Primary.	Secondary.	Primary.	Secondary.
Gas entering washer-cooler .	180	127	180·5	124·0
,, leaving ,, ,, .	127	85	124·0	85·5
Liquor entering ,, ,, .	119	85	119·0	85·0
,, leaving ,, ,, .	169	101	162·0	100·0

The results of this substitution of washer-coolers for tubular condensers have been very satisfactory. The total condensing capacity has been increased 50 per cent., while the ground area occupied by the condensing plant, including the pumping-station, has been reduced 25 per cent. The cooling surface in the new installation per unit of condensation is less than one-fifteenth that provided in the old tubular condensers. The labour of cleaning the apparatus has been reduced, and naphthalene stoppages have ceased. The effective scrubbing during condensation removes practically all the condensate as soon as produced; thus delivering a very much cleaner gas to the ammonia scrubbers than was obtained from the tubular condensers.

MIDLAND JUNIOR GAS ASSOCIATION.

The Opening Meeting of the Sixth Session of the Association was held at the City of Birmingham Technical School last Saturday—the chair being taken at the commencement of the business by Mr. A. O. Jones, of West Bromwich, the Retiring President.

Official Changes.

Mr. Jones remarked that, owing to the appointment which their Senior Vice-President, Mr. H. E. Temple, had obtained at Christchurch, New Zealand, it had been necessary to make an alteration in the officers of the Association. Mr. R. J. Rogers (Birmingham) had been transferred to the Senior Vice-Presidency; and the Council had elected Mr. W. S. Smart (Birmingham) Junior Vice-President.

The New President.

Mr. Jones said his next duty was to introduce to the members the new President, Mr. R. S. Ramsden, who had always displayed great interest in the Association. He was sure they would find in him a President always well to the fore in regard to anything that would enlarge the usefulness of the Association. Mr. Ramsden held a good appointment at Burton; and his career was likely to be a bright one. He wished him a successful year of office as President of the Association, and success in his work as a gas engineer.

Mr. R. S. Ramsden (Burton-on-Trent), who was cordially received on taking the chair, said the first duty—and a pleasant one—which he was called upon to perform was that of moving a hearty vote of thanks to Mr. Jones, his immediate predecessor in the chair. Mr. Jones had worked hard for the Association; and, though he had been rather unfortunate in having two of the papers which were down on the programme to be read during his year of office unavoidably cancelled, he had, by throwing himself heart and soul into the work, given them a really successful session. Outside his duties as President of the Association, also, those who had come into contact with Mr. Jones would agree with him (the speaker) in saying that he was always most courteous and willing to give any help in his power—particularly on those little points of detail in which the experience of another undertaking was often so useful in drawing up a scheme for one's own working.

Dr. W. B. Davidson, in seconding the proposition, said that he would like to endorse all that the President had stated in regard to Mr. Jones.

The vote having been heartily accorded,

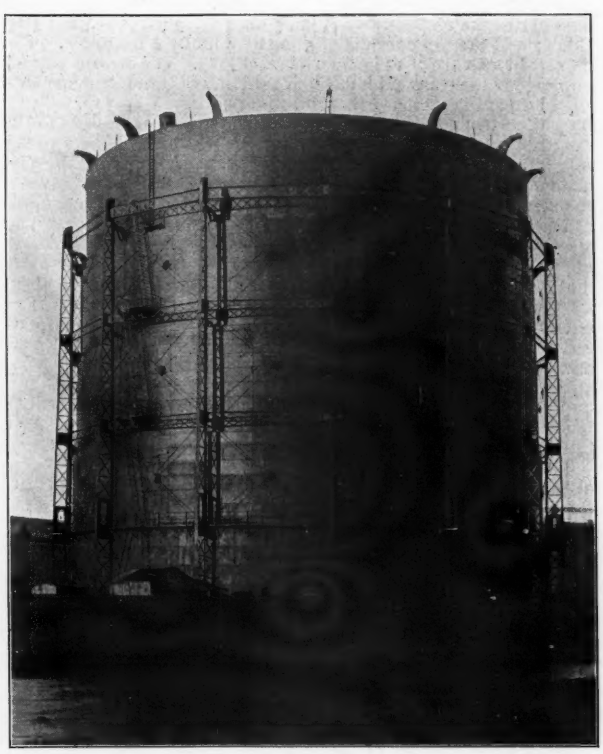
Mr. Jones acknowledged the compliment, and remarked that, though there were comparatively few papers last year, he was glad to be able to say that the programme for the present session had exceeded their expectations. The Council had had quite a number of papers offered which they had been obliged to hold over for a future session.

PRESIDENTIAL ADDRESS.

Mr. Ramsden then proceeded to deliver his Inaugural Address. After pointing out that the Association had been in existence for five years, and expressing the opinion that they might well congratulate themselves on keeping up the membership roll and the enthusiasm of the members, he referred to the reading and discussion of papers. The importance of the members becoming further acquainted with each other by means of informal gatherings was emphasized, as well as the fact that the writers would find that the preparation of a paper was a very pleasant form of education. In this connection, reference was made to the article on "Papers and their Preparation," by Mr. Norton H. Humphrys, which appeared in the "Journal" for Aug. 23 last (p. 521). Mr. Ramsden then continued as follows:

EXTENSIONS AT BURTON.

We have recently been extending and reconstructing part of our works at Burton-upon-Trent; and perhaps an account of some of the work may be of interest. Most of our retort-settings having become old-fashioned, the Gas Committee, in 1908, decided to replace them by something more efficient. At that time, we had one retort-house about ten years old, containing nine beds of eight through retorts, heated on the regenerative system, and four small retort-houses containing 150 retorts altogether, all direct-fired; and as there was no ground at the works suitable for retort-houses except that occupied by the old ones, arrangements had to be made for clearing away the four latter. In order to make it reasonably safe to do this, and with a view to more economical retort-house working generally, it was decided to increase our storage capacity, as our two holders held only a million cubic feet between them, while the maximum day's output was well over a million-and-a-half.



Dimensions: Tank 125 ft. diameter. Diameter of Lifts: 115 ft. 9 in.; 118 ft.; 120 ft. 3 in.; 122 ft. 6 in. Depth of Lifts: 25 ft. each.

Four-Lift Telescopic Gasholder and Steel Tank at Burton-on-Trent.

NEW HOLDER AND STEEL TANK.

By the time drawings and specifications for the new holder, tank, and foundation had been prepared by our Consulting Engineer (Mr. J. Ferguson Bell, M.Inst.C.E., of Derby), and tenders accepted, it was the middle of April, 1909; and we commenced operations by diverting a railway siding which went across the middle of the site of the new holder. In accordance with our usual custom, we had this work carried out by the Railway Company, finding part of the labour ourselves, to expedite matters.

FOUNDATION.

By the beginning of May, when we had cleared the site, the contractor for the foundation for the steel tank had obtained a convenient tip, and started excavating. Practically within a month, he had completed digging out a circle, roughly 133 feet in

diameter, varying in depth from 7 ft. 4 in. to 10 feet, and averaging about 9 ft. 6 in., representing about 6000 cubic yards of excavation, including the extra depth for the inlet and outlet pipes. The concrete foundation was formed of five parts of broken bricks and old retorts, one part sharp sand, and one part best heavy portland cement; a continuous concrete mixer in the form of a revolving cylinder 9 feet long being used. The materials were gauged dry in the usual way, and then shovelled in at the top of the cylinder, on the inner surface of which were a number of pieces of angle iron to help in mixing up the materials. A spray of water at the top was turned on at the same time, and when this was regulated properly, the mixing was quite satisfactory. But without close supervision, there was a liability for half a gauging to come out of the cylinder nearly dry, and the other half to follow of the consistency of thin grout. The mixer discharged the concrete alternately into two tip waggons running on tramways moved from day to day to enable the concrete to be tipped just where required. The foundation was put down in two layers, forming a circular block, 133 feet in diameter, with fourteen piers, 4 ft. 3 in. wide projecting 1 foot radially.

On the advice of the gasholder contractor, the top was formed with a rise of 6 inches in the centre; the thickness of concrete being 3 ft. 3 in. there and 2 ft. 9 in. at the circumference. This top was brought to a fairly smooth surface; and just before we were ready for putting together the steel tank bottom, an inch of dry sand free from stones was spread all over to within 2 ft. 6 in. of the edge of the tank. Very little timbering was required; and only a few days' hand pumping had to be done while excavating the trench for the inlet and outlet pipes. The time occupied in putting down the 1550 odd cubic yards of concrete was practically seven weeks.

TANK.

The steel tank is 125 feet in diameter by 26 feet deep. The bottom plates are $\frac{1}{4}$ inch thick, with the exception of the outer row of radial plates, which are $\frac{5}{16}$ inch thick, and a $\frac{3}{8}$ inch plate where the inlet and outlet pipes pass through the tank-bottom. The bottom curb is 5 in. by 5 in. by $\frac{1}{2}$ in. angle; the six rows of side plates are respectively $1\frac{1}{16}$ in., $\frac{5}{8}$ in., $\frac{1}{2}$ in., $\frac{3}{8}$ in., $\frac{5}{16}$ in., and $\frac{1}{4}$ in. thick; and the top curve is of 5 in. by 4 in. by $\frac{1}{2}$ in. angle. The 28 rest-blocks are of 12 in. by 6 in. steel joist. The central pier for supporting the truss-column when the holder is grounded, consists of a lattice stanchion 3 ft. 5 in. square, formed of 3 in. by 3 in. by $\frac{3}{8}$ in. corner angles, and $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. lattice bars bolted to the tank-bottom and surmounted by an oak rest-block bolted to the top. There are fourteen intermediate tank-guides, of 7 in. by 3 in. channel, weighing $17\frac{1}{2}$ lbs. per foot, at equal distances between the similar guides attached to the standards. These channels are secured to the tank by 4 in. by $\frac{1}{2}$ in. angle wing-plates. The steel inlet and outlet pipes are 24 inches diameter; the thickness of the vertical parts being $\frac{3}{8}$ inch and of the horizontal parts under the tank $\frac{1}{2}$ inch. They are stayed by means of three $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. steel angles secured to the tank-bottom. The overflow from the tank is of 3-inch wrought-iron tube. The platform round the top of the tank is 2 feet wide, formed of $\frac{1}{4}$ inch steel chequered plate strengthened by a 3 in. by 3 in. by $\frac{3}{8}$ in. angle at the outside, and supported by the top curb of the tank and 3 in. by 3 in. by $\frac{3}{8}$ in. angles, 7 ft. 3 in. apart, which are extended upwards to form the standards for two rows of 1-inch gas-tube hand-railing.

The tank-bottom was supported by a number of short props about 2 feet long while it was being riveted together; and when this had been done, the floor was just covered with water, and a man was sent underneath to make sure there was no leakage. The water was then run out again, the undersides of the plates were coated with hot tar, the weight of the tank-bottom was taken up by a number of screw-jacks placed at intervals round the circumference, the props were removed, and the tank lowered on to the sanded foundation. The border 2 ft. 6 in. wide under the tank which had been left unsanded, was filled up with a thick grout of cement and sand (1 to 2), well rammed in from the outside; and when this had set, hot tar was poured from funnels about 3 feet high through holes left for the purpose in the tank-bottom. The holes were then plugged up, and the tank bedded itself into the mixture of tar and sand spread all over the foundation. When the gasholder was completed and the tank had passed its final test, the bottom row of side-plates was coated with a mixture of eight volumes of tar, one volume of kerosene, and one volume of portland cement, put on hot; the cement being mixed with the kerosene before the tar was added, and the whole being kept well stirred while being applied. Carefully selected soil was then rammed against the sides of the tank, the sloping trench was filled up, the ground trimmed level with the top of the bottom row of plates, and a border about 8 feet wide was made of granite chippings. If it had been practicable, I should have preferred leaving all the side-plates exposed to view; but the site was too restricted to allow of this being done.

HOLDER.

The principal dimensions of the steel gasholder are as follows.

Inner lift.	—115 ft.	10 in.	diameter by	25	feet	deep.
Second lift.	—118 ,,	1 ,,	,,	,,	25	,,	,,
Third lift.	—120 ,,	4 ,,	,,	,,	25	,,	,,
Fourth lift.	—122 ,,	6 ,,	,,	,,	25	,,	,,
Tank.	—125 ,,	0 ,,	,,	,,	26	,,	,,

As to the guide-framing, fourteen lattice standards were carried up from the bottom of the tank for the height of three lifts only above the top of the tank, with three rows of lattice girders and three tiers of diagonal bracing or wind-ties. The crown is supported by 28 main rafters of 4 in. by 5 in. by $\frac{1}{2}$ in. tees, each with three $1\frac{1}{2}$ inches diameter struts and $1\frac{1}{4}$ inches diameter tension-rod. There are 28 main tension-rods $1\frac{3}{4}$ inches diameter from the gusset-plates at the top of the vertical stays to the bottom of the central column. Each tension rod has a coupling-box for tightening up, and is prevented from sagging by being suspended from the tension-rod of the main rafter by a $\frac{7}{8}$ inch diameter rod. The central truss column is 24 inches diameter and 12 feet long, formed of $\frac{3}{8}$ inch welded steel plate, with a 4 in. by 4 in. by $\frac{1}{2}$ in. angle ring and two circular plates 4 ft. 6 in. diameter by $\frac{3}{4}$ in. thick at both top and bottom. The top plates are bolted to the 28 main rafters, and the bottom ones to the 28 main tension-rods. In each of the 28 bays between the main rafters there are seven angle steel purlins; the outer one 3 in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in., the next two 3 in. by 2 in. by $\frac{1}{4}$ in., the next two $2\frac{1}{2}$ in. by 2 in. by $\frac{1}{4}$ in., and the two nearest the centre 2 in. by 2 in. by $\frac{1}{4}$ in. —each of them bent at the ends, and bolted to the main rafters. There are two top curbs; the outer one being of 5 in. by 5 in. by $\frac{3}{8}$ in. angle steel, and the inner or stiffening curb (which is 2 ft. $10\frac{1}{2}$ in. nearer the centre) of 5 in. by 5 in. by $\frac{1}{2}$ in. angle steel. The 28 vertical stays are formed of 12 in. by 5 in. joists, weighing 32 lbs. per foot, and extending 12 inches beyond the full depth of the inner lift. Their top ends are connected to the top curb and to the main rafters by two $\frac{3}{8}$ inch gusset-plates 3 feet long, riveted to the joists by angle-plates. They are bolted to the cup at the bottom, and the intervening length is free.

The crown of the holder has a rise of 5 ft. 8 in. The outer circle of crown-sheets is $\frac{1}{4}$ inch thick (except under the carriages, where it is $\frac{3}{8}$ inch thick), and is riveted to the two top curbs. The next circle is 10 B.W.G., and the remainder is 12 B.W.G., with the exception of the crown-plate, which is $\frac{1}{4}$ inch thick. The top and bottom rows of side sheets are $\frac{7}{16}$ inch thick; and the intermediate ones are 12 B.W.G. The cup is 20 inches deep, formed of 9 in. by 3 in. channel, weighing 19·37 lbs. per foot, riveted to the bottom row of side sheets above mentioned, and to a $\frac{7}{16}$ inch cup-plate stiffened at the top with a $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. steel bead.

The fourteen top carriages are made of two $\frac{1}{2}$ inch cheek-plates kept 12 inches apart by two distance-pieces, and mounted on the $\frac{3}{8}$ inch crown plates with 5 in. by 4 in. by $\frac{1}{2}$ in. angles. The rollers are 24 inches diameter, and 4 inches across the face, which is turned. All the carriages are fitted with screwed adjusting rods on each side of the roller, to enable the latter to engage without strain in the channel-guides on the standards; and all the rollers have oil-holes. The 28 cup carriages are also formed of two $\frac{1}{2}$ inch flanged cheek-plates bolted to the underside of the channel steel and to the 12 in. by 5 in. R.S.J. vertical stays. The rollers are 9 inches diameter by 3 inches across the face. The handrailing consists of the usual two rows of 1 inch wrought-iron tubing, carried by standards of 3 in. by $\frac{3}{8}$ in. flats. There are three manholes on the crown; those over the inlet and outlet pipes being of the Livesey pattern. Near the centre of the crown is a 2 inch plug-cock, with a length of 2 inches of wrought-iron tube below it reaching nearly to the water-level when the holder is grounded, for the purpose of blowing the air out before filling with gas. The second, third, and fourth lifts have the top and bottom rows of sheets $\frac{7}{16}$ inch thick, and the intermediate ones 12 B.W.G. Near the bottom of each lift is a manhole. The cups and grips are of similar construction to the cup of the inner lift. The vertical stays are 7 in. by 3 in. channels, weighing $17\frac{1}{2}$ lbs. per foot, bolted to the cup and grip-plates. The top carriages on the grip-plates are all formed of two $\frac{1}{2}$ inch cheek-plates; and those on the second lift are strengthened by two side stays of $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. angles bolted to the top of the inverted channel. The three sets of rollers are respectively 18 in. diameter by 4 in. across the face, 15 in. by 4 in., and 10 in. by $3\frac{1}{2}$ in.

The cup-carriages and rollers of the second and third lifts are similar to those of the inner lift. On the outer lift, the cup-carriages are of two $\frac{5}{8}$ inch cheek-plates bolted to the bottom curb, and the rollers are 10 in. diameter by $3\frac{1}{2}$ in. across the face. The bottom curb on the outer lift is formed of two 5 in. by 4 in. by $\frac{1}{2}$ in. angles. The fourteen lattice standards, about 100 feet high, are 4 ft. 3 in. wide from the base to the top of the tank, and then taper to 2 ft. 3 in. wide at the top. The front flange is formed of two 5 in. by 4 in. by $\frac{1}{2}$ in. angles back to back. The back flange is similar, and has the 7 in. by 3 in. channel-guide riveted to it. The diagonal and horizontal lattice bars are $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. flats up to the top of the tank. Above this they are 3 in. by $\frac{1}{2}$ in. From 2 ft. 6 in. below the tank platform to 6 ft. 8 in. above it, the lattice-work is replaced by a $\frac{1}{2}$ inch web-plate stiffened at the top with two 5 in. by 4 in. by $\frac{1}{2}$ in. angles, and provided with an opening 18 in. wide by 5 ft. 6 in. high, to allow of a passage round the platform. At the top of each standard is a cast-iron finial 2 ft. 6 in. high, the back corresponding at the base with the 7 in. by 3 in. channel guide, splayed out to a width of 12 in. at the top to receive the top rollers of the inner lift easily. The top flange of the standard under the finial is of two 4 in. by 4 in. by $\frac{1}{2}$ in. angles. The bottom flange is of two 5 in. by 4 in. by $\frac{1}{2}$ in. angles riveted to a base-plate 5 ft. by 2 ft. 6 in. by $\frac{1}{2}$ in. At the base of the standard there is a $\frac{1}{2}$ inch web-plate for a height of 2 ft. 6 in. in place of the lattice work, and a $\frac{1}{2}$ in. gusset-plate secured to the base-plate by a 5 in. by 4 in. by $\frac{1}{2}$ in. angle.

The three rows of girders connecting the standards together at approximately equal distances between the top of the tank and

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249.

the tops of the standards have the top and bottom flanges each formed of two 3 in. by 3 in. by ⅜ in. angles, with 2½ in. by ⅜ in. flat diagonal lattice-bars. The ends are of two 3½ in. by 3½ in. by ⅜ in. angles bolted to the standards; and the web-plates at the ends are ⅜ in. thick by 18 in. long. The top row of girders are 2 ft. 6 in. deep; and the middle and bottom rows, 2 feet deep. Between the several rows of girders and the top of the tank are three tiers of 1¼ in. diameter wind tie-rods, secured at the ends by angle-lugs to the lattice-girders or top of the tank, as the case may be, and in the centre of each bay passing through a strong steel ring with nuts on either side for adjusting the tension. There is a straight ladder secured to the inner lift, to gain access to the top when the lift is above the guide-framing, made just narrow enough from back to front to clear the grip-plate of the second lift when the holder is grounded. There are four ladders reaching from the ground to the top row of girders. They are placed in a sloping position, so as to be more easily climbed, and are 21 inches wide with 2½ in. by ⅜ in. flat-bar treads, 3 in. by ½ in. flat-bar sides, and a 1 inch wrought-iron tube for the handrail, carried by short cast-iron brackets. The three ladders above the tank each have a 3½ in. by 3½ in. by ½ in. angle-bar to stay them to one of the standards. At the middle and bottom row of lattice-girders, there are landing platforms 7 ft. by 5 ft. 6 in. between the ladders. The floors are of 2½ inch deals, carried on angle-brackets bolted to the girders; and the handrail consists of two rows of 1 inch wrought-iron tube carried by cast-iron standards.

There is an anti-freezing apparatus, consisting of four cast-iron injectors secured to the top of the tank and the grip-plates of the three bottom lifts respectively. The injectors warm the water, and cause it to circulate round the water-lutes; and each is fitted with a non-return valve. The main steam-supply pipe is 2 in., with a 1 in. branch to each injector; wrought-iron piping being carried about half way up one of the standards and connected to the injectors with flexible metallic tubing.

All the iron and steel work had a coat of boiled linseed oil applied before being delivered at the works; as soon as possible after erection, it was given a coat of red-lead paint; and on completion, it had two coats of a graphite paint. So far, the paint appears to stand satisfactorily. The usual tests for the steel plates and bars were specified; and the performance of them was witnessed in the test-rooms at the various rolling mills.

The erection of the inner lift of the holder was commenced from the tank-bottom; and when the sheeting of the top was well in hand, the cup of the second lift was placed in position on planks supported by the tank platform and the inner lift. These planks were in time replaced by screw-jacks; and the second lift was gradually lowered into the tank as the side sheeting was riveted up. The third and fourth lifts were erected and lowered similarly. As each cup was completed, it was filled with water and tested for soundness; and after the tank had been filled with water and the holder inflated with air, an inspection was made again from a raft inside the holder, to make sure that the cups were water-tight, and that the rollers were properly adjusted to the channel-guides. All the seams of the holder were tested with water for being gas-tight; and the holder was filled with air three times before any gas was admitted. Twenty-seven weeks elapsed from the day the contractor started unloading material to the day the holder was filled with air for the third time.

No quantities were given to the parties who tendered; but according to the information supplied by the contractor on the completion of the work, the weights were as follows:—

Tank, including steel inlet and outlet pipes and bottom lengths of standards	192	tons
Guide-framing (less bottom lengths of standards	79	,,
Four lifts	242¾	,,
	531¾	tons

The effective capacity of the holder is just over 1,100,000 cubic feet. The amounts actually paid to the two contractors were:

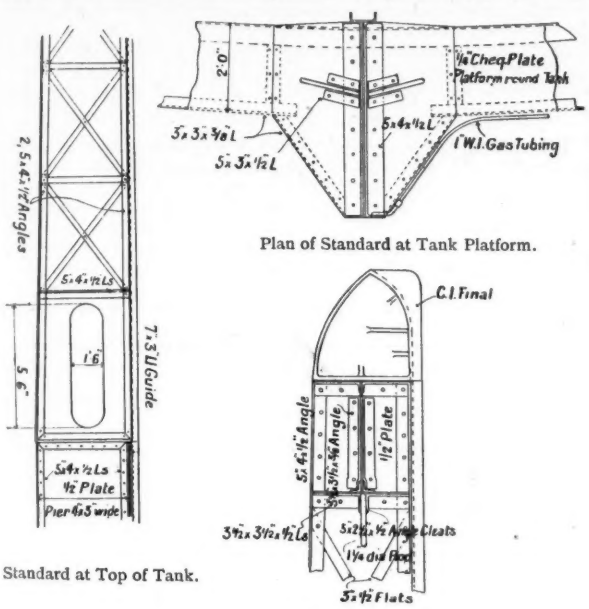
For the holder and steel tank	£8038	£9565
For the concrete foundation	1527	

The cost of altering our gasholder connections, putting in four new 24-inch valves, building a new valve-pit, laying about 180 yards of 24-inch cast-iron inlet and outlet mains, connecting the tank overflow to the sewer, levelling round the tank, printing specifications and plans, and proportion of Consulting Engineer's fees, brought up the total expenditure to £10,410, or £9 9s. 3d. per 1000 cubic feet of gasholder capacity. The accompanying are illustrations of a few details of the holder. The new holder was filled with gas in January of this year, by which time we had commenced pulling down some of our old retort-benches to make room for the new retort-house.

RETORT-HOUSE RECONSTRUCTION.

Practically the whole of the ironwork, including the retort-house roofs, was sold to scrap-iron merchants and cleared out of the way as soon as it was taken down. The good old fire-bricks were dressed and stacked, and afterwards sold to the contractors for the retort-bench and settings. The installation consists of ten beds of horizontal retorts in a new house, with De Brouwer stoking machinery and coke-conveyor; and as it is modelled on the lines of the new carbonizing plant at Derby, which Mr. Ferguson Bell described in his paper before the Institution of Gas Engineers last year, I will not attempt to give a full description of it, but merely indicate some points of difference from the Derby plant which Mr. Bell's further experience, and our special local conditions, led us to adopt.

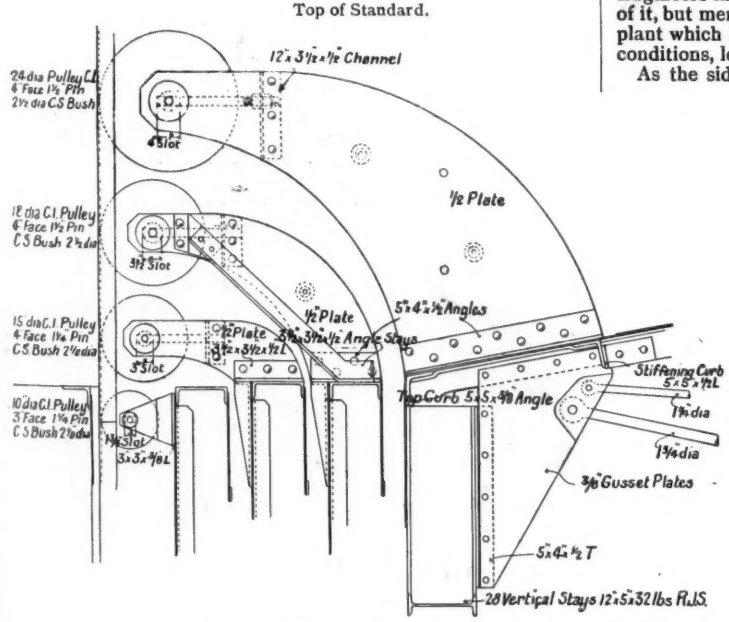
As the side walls of the new retort-house were built on the



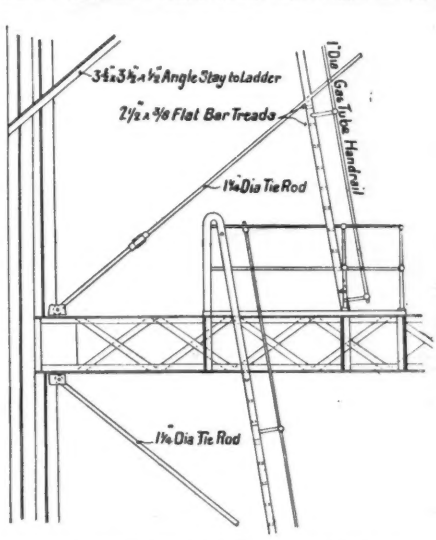
Standard at Top of Tank.

Plan of Standard at Tank Platform.

Top of Standard.


24 dia Pulley C.I. 4" Face 1½" Pin 2½ dia C.S. Bush
12" dia C.I. Pulley 6" Face 1½ Pin C.S. Bush 2½ dia
15" dia C.I. Pulley 4" Face 1¼ Pin C.S. Bush 2½ dia
10" dia C.I. Pulley 3" Face 1¼ Pin C.S. Bush 2½ dia
12"x3½"x½" Channel
4" Slot
½" Plate
3½" Slot
5" Slot
1¼" Slot
3x3x⅜ L
5x4x½ Angles
3½x3½x½ Angle Stays
Top Curb 5x5x⅝ Angle
Stiffening Curb 5x3x½ L
1¾ dia
3/16 Gusset Plates
5x4x½ T
28 Vertical Stays 12"x5"x32 lbs R.S.J.

Gasholder Top Curb and Carriages.



Sloping Ladders and Platform Secured to Girders.

Details of Four-Lift Gasholder and Steel Tank at Burton-on-Trent.

foundations (strengthened and renewed where necessary) of the end walls of the old houses, a width of 64 feet between the walls was obtained; and advantage was taken of this by putting in retorts 22 feet long. The retorts were also shaped so as to increase their cross sectional area, which, it will be seen, is considerably more than that of the ordinary 22 in. by 16 in. ⌂ retort. The object of this is to enable the retorts to be practically filled without the coke getting jammed.

Ordinary 22-inch by 16-inch Retort.

Burton-on-Trent 22-inch by 16-inch Retort

Instead of there being ascension-pipes, bridge-pipes, dip-pipes, and hydraulic mains on one side of the bench only, as at Derby, we have gone back to the old system of putting them at each side, but have reduced the size of the pipes from 8 in. to 7 in.; the reason for this being that, with a retort 22 feet long practically filled, there is thought not to be a sufficiently clear exit for the gas when there is an ascension-pipe at only one end. As at the time of writing all contracts in connection with the new retort-house are not completed, it is impossible to say what will be the effect of these alterations.

NAPHTHALENE TREATMENT.

Another interesting piece of work which we carried out last year was the erection of a naphthalene washer at the inlet to the gasholders. The washer is of the Livesey pattern, capable of passing 2 million cubic feet of gas per day; and in order to do away with the risk of stopping gas making with our then limited storage capacity for long enough to break through the gasholder inlet main, and insert tee-pieces for connecting up the washer, we had two 18-inch connections taken off the 24-inch main by the under-pressure drilling system. A blank saddle-piece reaching half-way round was first placed in position under the 24-inch main, and then another saddle with an 18-inch flanged branch was placed on top; the flanges of the two saddles being bolted together, and the annular spaces between the main and the saddle being yarned and caulked with molten lead, just as when two pipes are joined together with a slip socket. The 18-inch valve was next bolted on to the saddle, and the drilling machine was bolted on top again. The valve was then opened, and the 18-inch cup drill screwed down until it was in contact with the 24-inch main, and rotated until it had cut out an 18-inch disc, when the drill with the disc inside it was screwed up above the valve, the valve was closed, and the drilling-machine removed. Both connections were made successfully, without any mishap. The total cost of the washer, foundation, and connections was £204.

We use Derby solvene in the washer, and adjust it to throw a back-pressure of from 1 to 2 inches, either by altering the level of the liquid or by partly opening the bye-pass. From the end of May, 1909, when it was set to work, up to the end of August last, we used 1714 gallons of the Derby solvene, for which we paid £72 18s.; and during this time we made 427 million cubic feet of gas. So at Burton the process needs on an average 4 gallons of solvene, costing 3s. 5d., per million feet of gas. Until 1904, the naphthalene trouble was practically unknown at Burton. Then in the summer of 1906, it began to be a nuisance, affecting the public lamps first, and then consumers' services and meters—particularly in roads with shallow mains and services. We have about 10,000 consumers; and in 1908 we had 292 complaints from consumers due to naphthalene stoppages. In 1909, with the naphthalene washer in use from the end of May, we had ten complaints, and so far this year we have had only one. These figures testify, without comment, to the efficacy of the Derby process.

ACCIDENTS AND WORKMEN'S COMPENSATION.

In May, 1907, just before the Workmen's Compensation Act of 1906 came into operation, our Town Council considered the question of insurance, and, wisely, I think, resolved to take no steps to insure their workmen against accidents under the new Act. The lowest premium quoted at the time for insuring the gas-works employees alone was over £73 a year, and 5s. 6d. per £100 of wages if all the Corporation workmen were insured; whereas our record since the Act came into operation has been as below.

Period.	July, 1907, to June, 1908.	July, 1908, to June, 1909.	July, 1909, to June, 1910.	Total.
Total number of accidents.	18	14	16	48
Total wages after deducting pensions, sick, and accident pay	£12,693	£11,867	£11,885	£36,445
Amount of accident pay. Total. . .	£28 19s. 1d.	£59 6s. 3d.	£22 11s. 8d.	£110 17s.
Amount per £100 of net wages . . .	4s. 7d.	10s. *	3s. 10d.	6s. 1d.

* Over £27 was paid during the year 1908-9 to one man who was away for 50 weeks with a broken arm.

We make an allowance to a workman if he is away from work owing to an accident for three days or more, just as we do in the case of sickness, instead of keeping strictly to the Act and allowing nothing during the first week if the man is away for less than two weeks. To minimize the ill-effects of accidents as far as possible, we encourage our men to become qualified members of the St. John Ambulance Association.

MANTLES FOR STREET LIGHTING.

For the last five years, we have bought our mantles for street-lighting purposes on terms which, I think, are not in very general operation, so perhaps it may be interesting to state them. The Company who have supplied us have sold us the mantles at so much per gross, and guaranteed that if we required more than eight mantles per burner per annum on the average, they would supply the excess quantity free of charge, provided that we used no mantles but theirs during the contract. The Company have always accepted our figures without hesitation, and carried out their bargain most satisfactorily.

MAINTENANCE ON CONSUMERS' PREMISES.

With reference to the maintenance of consumers' burners and fittings, &c., I am inclined to think that, for a Corporation like Burton, who have not a regular private gas-fitting business, apart from stoves and installations in connection with prepayment meter supplies, the best course is to clean out and adjust burners, fires, stoves, &c., free of charge, and let the consumer find his own mantles and other materials. The drawback to the system is that not enough people take advantage of it, though we call their attention to it by gummed slips on the gas bills. We also call attention to the offer by periodical paragraphs in the local papers and by various other means. I am afraid I cannot see a remedy for this state of affairs; for if we had a staff of young men going to every consumer, house by house, adjusting burners, they would probably be simply annoying people whose burners happened to be in order, while other people would still go on for weeks dissatisfied with dirty burners, but not making a complaint at the proper quarter.

PREPAYMENT SUPPLIES WITH AND WITHOUT STOVES.

Prepayment meters were introduced into Burton in 1896; and we went into the business whole-heartedly from the start—laying services, fixing penny or sixpence in the slot meters, piping old (but not new) property, and supplying within reason as many brackets and stuffing-box pendants as were required, together with a useful griller 13½ in. by 12½ in. by 10 in., with two burners, insisting that the griller was fixed in every case. There is, of course, nothing out of the ordinary in all this; but I mention the matter with a view to recommending those of you who have not already done so to consider the advantage of supplying your prepayment consumers with stoves. We started doing this in 1908, on the advice of our Consulting Engineer; and the results have been quite satisfactory. We decided on a good sized stove, 31 inches high, with oven 26 in. by 15 in. by 12½ in., with packed sides and door and three burners on the top, restricting ourselves to two first-class manufacturers, and insisting on their making everything above the hot-plate interchangeable; these being the parts which most frequently want renewing, though it appears that this course does not meet with the unqualified approval of the Technical Press. We ordered 500 stoves at first; and after 300 of them had been in use for six months, the results were as follows.

		Cubic Feet a Year.
Prepayment consumers with stoves used 40 cubic feet a day, or at the rate of		14,600
Prepayment consumers with grillers used 25 cubic feet a day, or at the rate of		9,100
Increase due to stove, 60 per cent., or		5,500
	Per Annum. s. d.	s. d.
Increased revenue, 5500 cubic feet, at 3s. 4d. per 1000 cubic feet		18 4
Expenditure.		
5500 cubic feet of gas at 1s. 6d. per 1000 cubic feet (this being approximately net cost, including manufacture, purification, distribution, management, and establishment charges)	8 3	
Depreciation and maintenance of the stove, paid for out of revenue at a cost of 47s. fixed complete with piping, &c., as compared with 12s. 9d. for the griller, fixed complete—difference 34s. 3d. 12 per cent. on this amount	4 1	12 4
Annual profit on each stove.		6 0

Our Town Council were satisfied with the results, and ordered another thousand stoves, of which we have fixed rather more than one-half; and I see no reason why the system should not be extended in time to the whole of our prepayment consumers, who last March numbered 5508, as compared with 4834 consumers by ordinary meter. As far as possible, we sell the grillers which are displaced to ordinary consumers who are without stoves, at 5s. fixed complete; and the surplus we send to the makers supplying the stoves, who give us a small allowance for them as scrap iron.

INCANDESCENT FITTINGS FOR PREPAYMENT CONSUMERS.

Another innovation which we made this year was to supply for new prepayment installations a neat, well-designed harp-fitting suitable for either an upright or inverted incandescent burner,

instead of a stuffing-box pendant, which is really not suitable for anything but an obsolete flat-flame burner. We do not include an incandescent burner, but suggest to the consumer that he should buy this from one of the local tradesmen. This innovation is much appreciated by our consumers, and the difference in cost is only about 7d.

Vote of Thanks to the President.

Mr. Jones proposed a vote of thanks to the President for his interesting address, which, he said, the members would study with profit when it appeared in the Technical Press.

Mr. R. J. Rogers (Birmingham) seconded the vote; and it was passed with acclamation.

An Invitation to Burton.

The President, after acknowledging the vote, said the members would see by the programme that on April 8 it was intended to visit a gas-works. Since the programme was printed, he had, with the acquiescence of the Council, brought before the Gas and Electricity Committee of Burton-on-Trent the question of a visit by the members of the Association to the works. The Committee had authorized him to say that they would be delighted to see the Association on that date; and if the members were agreeable, he would be pleased to make arrangements for an inspection of the works and for some little entertainment afterwards. The Hon. Secretary would make an announcement with regard to the first of the informal meetings to which he had alluded in the opening portion of his address.

Tar Distillation.

Mr. A. R. Warnes, of Messrs. J. Hardman's Tar Distillery, Birmingham, then read a paper on "Tar Distillation," which will be found on pp. 131-35. The author amplified many of the points in the paper; and the description of the apparatus employed he accompanied by numerous sketches on the blackboard.

Promotions.

The President said he felt sure those present would like to hear read a list of the promotions which members of the Association had recently secured.

The Hon. Secretary (Mr. G. C. Pearson), after referring to the fact that Mr. Hubert Pooley, an honorary member of the Association, was removing from Stafford to Leicester, went on to say that the following promotions had taken place among the members: Mr. James Hewett, to Distribution Engineer of the Birmingham Corporation Gas Department; Mr. T. Brooke, from Adderley Street to Superintendent at Nechells; Mr. C. C. Barber, from Adderley Street and Nechells to Superintendent at Adderley Street; Mr. H. E. Temple, from Nechells to Assistant Manager at Christchurch, New Zealand; Mr. R. Wardell, from the Council House, Birmingham, to Assistant Manager at Cambridge; Mr. T. H. Poulson, from Stafford to at Cannock; Mr. G. E. Holmes, from Saltley to General Foreman at Southampton; and Mr. W. Ault, a pupil at Tipton, to Junior Draughtsman at Saltley.

An Alteration.—The Coffee Meetings.

The Hon. Secretary said it was announced in the programme that in January there would be an evening visit to the Birmingham works of Messrs. Parkinson and W. & B. Cowan. He had, however, had a communication from the firm to the effect that they were making some alteration to the works, and that therefore it might be better for the visit to be put off for about two months. Under these circumstances, it had been decided that this visit should be put forward to March, and that the Council should make arrangements for another visit in January to take its place. The President had suggested that the Association should hold "coffee meetings;" and it had been determined that the first of these should take place immediately after the next general meeting, on Nov. 12. Of course, there would be no reporting; the idea being to make these gatherings as social as possible.

In a recent number of the "Comptes Rendus" of the Paris Academy of Sciences, MM. Ernest van den Broeck and E. A. Martel deal with the conditions of effective filtration of the underground waters in certain chalk formations. It appears that in Belgium the crinoidal chalk at the base of the carboniferous strata of the Dinant geological basin furnish filtered potable waters in a remarkably constant manner.

Cinders for stopping leaks in dams have been used, according to "Engineering Record," by a local Light and Power Company at Joliet (Ill.). On account of the absence of headgates in the plant, it is necessary, when repairing the water-wheels, to shut the water off from the wheel-bags by sliding 2-inch planks down through the frames of the trash racks. Such leaks as remain are filled by scattering a few sacks of cinders along the planks. Before the use of the cinders was hit upon, straw, canvas, sacks of sand and clay, and almost everything that could be thought of, were tried in the effort to close the leaks, but without success. Finally, cinders were used, and they closed the apertures completely. It is explained by the Chief Electrician of the Company that the large pieces of cinders seem to find the openings, into which they are drawn by the force of the water, and stick tightly in them, while the smaller pieces fill in the remaining cracks until the openings are entirely closed. Cinders, of course, will not be of any use where the openings to be filled are very large,

COAL-TAR DISTILLATION.

By Arthur R. Warnes.

[A Paper read before the Midland Junior Gas Engineering Association.]

Though coal tar is an accidental, but unavoidable, bye-product obtained in the process of the carbonization of coal, it is at the present day a valuable asset to the gas undertaking. The extent of the chemical industry of which coal tar is the starting point is enormous; and it is not possible to predict with certainty when it will reach its limit. It is said that the industry originated with a German Chemist, Johann Joachim Becher, and was followed up later by Clayton (1737-38), Accum (1815), and Bethel (1838).* In 1856, the late Sir William Perkin discovered the first aniline colour, mauve—benzene being the starting point; and this discovery gave impetus to the coal-tar distilling industry.

Coal tar is a black, viscid liquid possessing a characteristic smell. The specific gravity varies between 1·1 and 1·2 at 60° Fahr. It is a very complex mixture of chemical compounds, the number of which amounts to upwards of 190. Compounds of the aromatic series generally occur in the larger quantity, and those of the aliphatic series in the smaller. There also occurs in coal tar a substance known as "free carbon," about which a few words will be said later. The amount of each series of hydrocarbons and also the "free carbon" varies—the two series to a lesser degree, and the carbon to a greater—according to the temperature at which the tar is formed, to the kind of retort employed, to the sort of coal used, and, in all probability, to the pressure existing in the retort.

The nature of the raw material and the temperature of carbonization of the coal influence the quantity, and to a much greater extent, the quality, of the tar. As regards the nature of the raw material, coal tar obtained from cannel coals is of less value to the distiller than that obtained from the bituminous coals. It contains an excessive quantity of bodies of the paraffin series. Much shaley matter present in coal will result in the production of a tar containing an undesirable percentage of the same compounds. Coals from different parts of the country yield tars of a more or less different nature. North Country coals yield a tar containing a good percentage of creosote, naphthalene, and anthracene, and a lesser percentage of light oils; while the coals obtained from Lancashire, Yorkshire, and the Midlands produce a tar containing rather less creosote and naphthalene, and more light oils.

The quantity of tar yielded from coal appears to vary according to the percentage of oxygen in the latter. [Bunte, "Journal für Gasbeleuchtung," 1886.] This worker's results have received confirmation by the report on 1012 trials made on a working scale by the Paris Gas Company (1874-1884) with 59 different classes of coal.† As a result of these trials, the following conclusions were arrived at: "The higher the percentage of oxygen, the more tar and ammonia are formed, and the more hygroscopic water is contained in the raw coal. On the other hand, the yield of coke and gas is less with a rise in the percentage of oxygen." Newbigging, in his "Gas Manager's Handbook," also confirms that the production of tar increases with the percentage of oxygen in the coal. He states that the average percentage of oxygen in Newcastle coal is 5·69, and in Lancashire coal 9·53; and he points out that the yield of tar bears some ratio to these figures.

Considering, now, the effect of temperature of carbonization on coal tar, we find that high heat tars contain but mere traces of paraffins, small quantities of olefines, and acetylenes, benzene hydrocarbons, and naphthalene in large quantity. The nitrogen occurs principally in the form of pyridine bases; and the predominant phenols are carbolic acid and the cresols. Free carbon occurs in large quantity.

Low-temperature tars generally contain less naphthalene and hydrocarbons of the benzene series, a large quantity of the paraffin and olefine series of hydrocarbons, less free carbon, and the nitrogen occurs principally in the form of aniline. The phenols are more complicated than those occurring in high-temperature tars; those predominating being of the guaiacol and creosol type.

In connection with the effect of temperature on the quality of coal tar, Lewis T. Wright ‡ carried out a number of carbonization experiments on the same kind of coal, and examined the composition of the tars yielded. The temperatures used varied between 600° and 800° C. The results are given in the following table.

—	1.	2.	3.	4.	5.
Cubic feet gas per ton coal	6,600	7,200	8,900	10,162	11,700
Specific gravity of tar	1·086	1·102	1·140	1·154	1·206
Composition of tar (by weight)	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Ammoniacal liquor	1·20	1·03	1·04	1·05	0·383
Crude naphtha	9.17	9·65	3·73	3·45	0·995
Light oils	10·50	7·46	4·47	2·59	0·567
Creosote oil	26·45	25·83	27·29	27·33	19·44
Anthracene oil	20·32	15·57	18·13	13·77	12·28
Pitch	28·89	36·80	41·80	47·67	64·08

* Lunge "Coal Tar and Ammonia," Fourth Edition, pp. 6-11.

† "Journal de l'éclairage au Gaz," July, 1886.

‡ "Journal of the Society of Chemical Industry," 1888, p. 59.

The same worker* obtained the following results with a Derbyshire Silkstone coal.

Temperature.	Sp. Gr. of Tar.	Free Carbon.	Remarks.
		Per Cent.	
800° C.	1·000	about 15	
1100° C.	1·207	25–30	Quantity of tar fell

With a rise in the temperature of carbonization, Watson Smith* found that tar yielded more naphthalene and anthracene, and that carbolic acid appeared not only in the carbolic oil, but in the heavy oil also.

That the type of retorts used is responsible for variation in the quality of tar obtained is shown in the following table, compiled by Mr. R. O. Wyne-Roberts, M.Inst.C.E., of Westminster.

According to Mr. O'Connor,† Glover's chamber retorts yield a much thinner tar than that obtained from horizontal retorts. The

—	Tar from Horizontal Retorts.				Tar from Vertical Retorts.				Tar from Inclined Retorts.	Tar from Chamber Retorts.	Tar from Coalite Process.
	(1)	(2)	( )	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sp. gr. at 60° Fahr.	1·2	1·25	1·22	1·25	1·1	1·12	1·119	1·13	1 095	1·18	1·07
Composition by distillation—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Light oils below 170° C.	3·10	1·1	1·4	1·1	5·85	1·7	3·7	2·3	4·4	0·4	10·8
Middle oils 170–270° C.	7·68	13·1	10·5	13·1	12·32	21·9	20·2	16·5	28·5	10·2	20·0
Heavy oils 270–350° C.	10·15	13·2	16·14	13·2	11·95	21·6	23·1	20·8	19·2	30·1	30·0
Anthracene	11·64	—	—	—	15·95	—	—	—	—	—	—
Pitch	62·00	72·6	71·8	72·1	49·75	54·8	52·6	60·0	47·5	53·9	39·2
Naphthalene	—	—	—	9·0	—	3·6	4·8	3·6	—	4·7	—
Free carbon	about 20	—	—	28·7	2 to 4	0·4	4·2	0·6	2·6	11·1	—
Water in tar	—	—	6·0	—	—	—	—	—	2·2	10·1	—

proportion of light and heavy oils are increased, and the free carbon percentage decreased.

Local superheating of the gas is, according to Kunath,† the principal cause of the thickening of tar. He considers that thinner tar is to be obtained by charging the retorts with as much coal as possible, and thus reducing the gas space and contact surfaces. The result obtained by using heavy charges, as suggested by Mr. Charles Carpenter, has to a large extent confirmed Kunath's conclusions.

At this juncture, a few words on "free carbon" will not be out of place. To the tar distiller, this substance is a perfect nuisance. It reduces the quality of the pitch made from the tar, and is probably the chief cause of the burning of the plates composing the tar-still bottom. During the operation of distillation, a portion of the "free carbon" contained in the tar drops to the bottom of the still, and this bakes on. When the pitch is run off, this baked "free carbon" tends to hold a small quantity of the former; and the heat stored up in the brickwork surrounding the still carbonizes the pitch left behind, and this, together with the baked "free carbon," forms a hard coke-like layer on the still bottom. This layer is a bad conductor of heat. How the presence of this non-conducting layer—which increases in thickness with each distillation—materially assists in the burning and buckling of the plates of the still bottom, will be clearly seen when the high temperature necessary to finish the distillation process is taken into consideration. Several attempts have been made to remove the "free carbon" from the tar before distillation; but none of them has turned out a commercial success.

The name "free carbon" is somewhat misleading, as this material is not actually pure carbon, but contains other substances as well. I have carefully precipitated this material out of tar by the aid of crude naphtha, and have thoroughly washed it with 90's benzol. After allowing it to dry at the atmospheric temperature for some months, I obtained a brownish black powder. This material lost by volatilization, at 100° C., 6·74 per cent. of its bulk; 84·55 per cent. of this volatile matter being driven off during the first hour of heating. The volatile matter is of a heavy, oily nature, resembling somewhat the condensed vapours from hot pitch. The mean of several ash determinations is 1·59 per cent.; and this ash consists chiefly of oxide of iron. A portion of the "free carbon" is soluble in ether, alcohol, chloroform, and petroleum spirit.

A rapid method of determining approximately the percentage of "free carbon" in the high temperature tars of to-day is secured by the use of a Twaddel hydrometer and the following general formula.

$$\text{"Free carbon"} = 0{\cdot}8n - 10,$$

where n = the degrees Twaddel of the tar.

I have tested this method a large number of times, with excellent results; and the same good results have been obtained by some of my fellow workers, both with Yorkshire and Midland tars. The following are a few examples.

—	° Twaddel.	Free Carbon by Chemical Test.	Free Carbon by Formula.
		Per Cent.	Per Cent.
1	47	27·87	27·6
2	39	21·50	21·2
3	41	22·80	22 8
4	43	24·70	24·4
5	32	14·85	15·6
6	42	23·76	23·6
7	45·6	26·79	26·48

In this paper, I do not intend to deal with the coal tars obtained from coke-ovens, gas-producers, blast-furnaces, and the coalite process. I will, therefore, give you a few particulars of the yield of distillates obtained in the distillation of coal tar produced in the process of gas making, and then bring before your notice the plant used in the process of distillation.

Yorkshire Tars.

	(A.)	(B.)
Liquor	7·3 galls. per ton tar	1·8 galls. per ton tar
Crude naphtha	14·0 " " " "	10·5 " " " "
Light oil	23·4 " " " "	12·3 " " " "
Creosote	35·1 " " " "	53·5 " " " "
Anthracene oil	28·1 " " " "	6·0 " " " "
Pitch	9·3 cwt. " " "	11·5 cwt. " " "

Northern Tar.

Liquor	11·5 per cent.
Crude naphtha	0·9 "
Light oil	3·0 "
Creosote	15·6 "
Anthracene oil	10·4 "
Pitch	57·5 "

Metropolitan Tars.

[Lunge "Coal Tar," Fourth Edition, p. 412.]

	Silvertown. Per Cent.	Beckton. Per Cent.
Ammoniacal liquor	4·16	2·00
Crude naphtha	1·50	1·66
Light oil	1·16	1·62
Creosote and naphthalene	14·16	15·70
Anthracene oil	14·00	18·83
Anthracene	1·80	1·90
Pitch	60·00	56·29
Loss	3·22	2·00

Midland Tar.

Ammoniacal liquor	4·50 galls. per ton tar
Crude naphtha	4·36 " " " "
Light oil	18·20 " " " "
Middle oil	9·20 " " " "
Creosote and anthracene oil	31·80 " " " "
Pitch	12·90 cwt. " " "

In a modern tar distillery, the following plant is required for the distillation of tar: Storage tanks, steam-boilers, pumps, stills, preheaters, condenser coils and condenser tanks, collecting and dividing boxes, apparatus for dealing with foul gas, receivers for distillates, pitch-coolers, and a pitch-bay. It will not be necessary to deal with steam-boilers in this paper.

Dehydration Apparatus.—Although several types of apparatus have been invented to rapidly carry out the process of dehydration—and some of them are in use—the usual method, at least in England, is to allow the tar to undergo prolonged rest in large storage tanks or wells. Heating the tar and then allowing thin films to flow over inclined surfaces, centrifugalizing, and grinding between heated rollers, are examples of some of the methods suggested to secure the dehydration of tar. In a recent patent, Wilton (No. 26,910 of 1907) proposes the use of apparatus consisting of a series of coils, one end of which opens into a moderate sized chamber. The tar is freed from water in this apparatus as follows: As it flows through the coils, it is heated to about 130° C. under a pressure of about 30 lbs. to the square inch. On reaching the end of the coil, the hot tar drops into the chamber, and the pressure being reduced, steam and light oil vapours escape and are condensed by a suitable condenser. The hot dehydrated tar is conducted direct to the stills. This plant is said to be in use at the present time at the Beckton works.

Stills.—For the distillation of tar, stills of almost all sizes and shapes have been used. At the present day, however, horizontal and vertical stills are the chief kinds employed. In England and Germany, the vertical type finds the most favour; and experience proves that it is still the most economical to use. Horizontal stills do not work so rapidly, and more fuel is consumed per ton of tar distilled—*e.g.*, 3·5 cwt. of fuel per ton of tar distilled, against 1·5 cwt. when a vertical still is used. There is also greater risk of the still becoming injured by burning if this type is used.

* "Journal of Gas Lighting," Vol. LII., p. 169.
† "Chemiker Zeitung," 1885, p. 1893.

* "Journal of the Society of Chemical Industry," 1889, p. 950.
† "Proceedings of the Institution of Gas Engineers," 1909, p. 127.

The vertical still consists of a cylinder of nearly equal height and diameter, provided with a dome-shaped top and a concave bottom. The bottom is now usually made in sections, in order to facilitate repairs, and to give additional strength. The advantages of building a still with a concave bottom are: (1) A large heating surface is secured; (2) the metal can expand and contract with comparative ease; (3) the stiffness of the bottom is increased; (4) the pitch drains off more completely than with any other shape. The bottom is not sprung directly off the side of the still, but from a channel plate, which is itself attached to the inside of the still. A very large number of stills of this type are constructed with high-pitched domes; but this is a mistake. It does not add to the efficient working of the still, nor is it necessary from the point of view of strength; and it materially assists in the process of corrosion—the nightmare of the tar distiller. Low-pitched domes should be put in; and they should be built in segments. The shell plates should be between $\frac{3}{8}$ inch and $\frac{1}{2}$ inch thick, the bottom plates $\frac{9}{16}$ inch to $\frac{3}{4}$ inch, and the dome plates $\frac{7}{16}$ inch to $\frac{9}{16}$ inch, according to the size of the still. Wrought iron of the best quality should be used throughout the construction. All rivet-holes should be drilled, not punched—thus doing away with the risk of torn or strained plates next the rivet-holes, and consequent weakened seams. Cast-iron tar-stills have been suggested, and are sometimes put in; but this is not to be recommended. There is the almost certain risk of faults occurring in such large castings; and the danger of the bottom cracking is very great. They are more difficult to repair, when occasion requires, than wrought-iron stills; and the fuel consumption is larger, owing to the greater thickness of metal.

The still is provided with the following fittings: A safety-valve or similar contrivance, a charge-block for connecting up to the charging-pipe, a steam-pipe inlet-block and dipping-cock, a manlid stool and lid, a tail-pipe for running off the pitch, a swan-neck for leading off the distillates, and a steam-pipe inside connected to a perforated coil or criss-cross arrangement. A thermometer-pipe is sometimes fitted either into the dome or the top of the swan-neck. The safety-valve is provided in order to give warning of stoppage in the condensing-worm. If the still is working normally, there should be very little pressure inside the still. The swan-neck should be made of cast-iron, in order to resist to a greater extent the corrosive action of some of the distillates. The portion riveted on to the dome should be between 12 inches and 24 inches inside diameter, and should narrow down to between 4 inches and 6 inches, according to the size of the still. The manhole should be at least 16 inches, and the stool and lid of cast iron. The charge-block and steam-inlet block are also of cast iron. The tail-pipe is made of wrought iron riveted on to the still. The steam-pipe varies between 1 inch and 2 inches, according to the size of the still.

All exposed portions of the still should be carefully lagged; and this applies particularly to the spots where the cast-iron stools, &c., are connected to the dome. In addition to the saving in fuel secured by lagging, the corrosion trouble is to a certain extent alleviated. As was pointed out by myself and my Chief Assistant, Mr. W. S. Davey, in a paper recently before the Birmingham Section of the Society of Chemical Industry,* corrosion of tar-stills occurs at great speed where there is excessive condensation—for instance, under the manlid and charge block stools.

In order to protect the plates of the still-bottom, and to effect fuel economy, care should be given to the method of setting the still. It is advisable to protect the bottom of the still with a curtain-arch; and though a little more fuel is consumed per ton of tar distilled (0·18 cwt. per ton of tar distilled), this extra cost is more than covered by the saving effected in repairs. The best type of flue to use is that known as the "Wheel" flue. With this, the flames and hot gases pass from the furnace through several pigeon-holes, and up two short vertical flues into a lower annular flue. The flame and gases before entering this flue are divided into two portions by a baffle-wall. One portion of the current, therefore, passes round one-half of the lower portion of the still, and the other round the opposite half. The flame and gases are now led by means of a further two short vertical flues into the top annular flues, and thence to the downtake and into the main flue to the chimney-stack. The width of the annular flues varies from 9 inches to 14 inches, according to the size of the still.

The tail-pipe (or run-off pipe) of the still is protected from the hot gases by building the lower baffle-wall round it.

Preheaters.—The idea of preheaters seems to have originated with Edison and Davis (Patent No. 13,929 of 1886). A preheater is very similar in shape to a tar-still, having a flat bottom and dome-shaped top. It holds a little more than a still charge. An overflow-pipe is placed in such a position that all surplus tar (that which reaches the overflow outlet owing to expansion when it gets hot) can be led away to a special tank, thus leaving in the preheater a correct still charge of hot tar. This apparatus is built of wrought-iron or mild steel plates; the thickness varying between $\frac{5}{16}$ inch and $\frac{3}{8}$ inch. It is not necessary to build of thick plate, as wear and tear is not very great. The mountings consist of a charging-block and dipping-tap, a vapour-pipe which leads to a common main and condenser coil, a discharge-pipe and cock, and an overflow-pipe. The position in which a preheater is placed is such that the first portion of the condensing coil from the tar-still can pass through it, and the hot tar be discharged into the still by gravitation. The amount of condensing coil used inside the preheater is usually five to eight laps of $2\frac{1}{2}$-inch to 4-inch wrought-iron pipe, according to size of still. The best pipe to use is extra thick steam, $\frac{5}{16}$ inch in thickness. If this thickness is employed, the top lap, which is the portion of the coil that suffers most severely from internal corrosion, will last between fourteen and sixteen months, against six months if only $\frac{3}{16}$ inch steam-tube is used. Cast-iron tube would be better from a corrosion point of view; but it is more cumbersome, and on account of its thickness the transmission of heat from the distillate to the tar in the preheater would be slower.

Condenser Tanks.—These are of various shapes—*e.g.*, square, rectangular, or cylindrical. The size depends upon several conditions—such as whether the tank is to contain more than one condensing worm, the size of worm, and the size of the still. Ordinary wrought-iron or cast-iron tanks will do. They should be provided with a drain-cock to run off the water in case the tanks or coils require to be repaired. An outlet is necessary near the top of the tank, to allow the cooling water to escape during the first part of the distilling operation. Some sizes of cylindrical tanks in use are: 5 feet to 8 feet in diameter and 6 feet to 9 feet deep, and square tanks 20 feet by 6 feet by 16 feet deep, and 8 feet by 8 feet by 8 feet.

Condensing Worms.—These consist of laps of pipe, each lap being circular, square, or rectangular in plan. The pipes are made of either cast iron or wrought iron, though the latter is preferable, as the thickness of the cast iron hinders somewhat the cooling or warming of the distillates, as the case may require. Some coils are made in sections joined by flanges; others are in one piece. The latter are considered the better type by some, as there is less chance of leakage. The coils generally corrode from the top downwards; and the top laps of coils last, on an average, about three years, if wrought-iron tube of $\frac{3}{16}$ inch thickness is used. Cast-iron tubes do not corrode anything like so rapidly as wrought iron. The bores of condenser tubes vary from 2 inches to 4 inches, and the length of pipe in the worms between 130 feet and 300 feet per still. For a 20-ton still provided with a preheater, about 130 feet of 3-inch wrought-iron pipe is sufficient. The length of pipe in the form of a coil in the preheater should be about 120 feet, if 3-inch bore is employed. A steam-inlet should be arranged for in a suitable position on the coil, in order to admit steam in case of stoppage.

Receiving and Dividing Boxes.—These vary a little in different works. In some cases, the receiving box has several outlets provided with cocks, and each outlet is connected to a separate main, by which the different distillates are conducted to their respective receivers. This is the best plan. Other receiving boxes are provided with two outlets only, one to the divider-box for use in the case of the first distillate—the liquor and crude naphtha—and the other for the various light and heavy oils. The latter outlet is connected by means of various T-pieces and cocks, &c., to the mains leading to the receivers for the several distillates. In size these boxes vary between 2 feet and 4 feet cube.

The divider-box is an apparatus generally cylindrical in shape, and varying in size between 20 inches and 24 inches deep by 14 inches and 18 inches in diameter; the top often being covered in. There is a hole in the cover, into which an inlet-pipe is fitted; and two holes in the cylinder, one on each side and almost at the top, into which outlet-tubes are screwed. The centres of the two holes in the cylinder are on the same level. One outlet-pipe bends down inside the divider-box, and reaches to within about 1 inch of the botton; and the other just enters. The ammonia water in the first fraction, sinking to the bottom, leaves by the former outlet-pipe, while the crude naphtha remaining on the top leaves by the latter outlet.

Before turning from this subject, it should be mentioned that the receiving boxes are covered, and are provided with outlets which are connected to a foul-gas main.

Foul-Gas Mains.—In accordance with the Alkali, &c., Works Regulation Act of 1906, it is required of the owners of any works specified in the schedule of the Act to use the best practicable means to prevent the discharge into the atmosphere of all offensive or noxious gases, or render such gases harmless before discharging into the atmosphere. During the distillation of the tar and the running-off of the pitch into the coolers, offensive fumes and noxious gases are given off; and it is necessary these should be dealt with according to the Act. The plant used in tar distilleries for this purpose varies somewhat according to the ideas of the management. In all cases, it is necessary to provide foul-gas mains to conduct away the gases and fumes from (*a*) the worm-ends and collecting-boxes, (*b*) the receivers, and (*c*) the pitch-coolers. Pipes are therefore connected to these portions of the plant; and they carry the gases, which are drawn forward by means of steam-ejectors or an exhaust-pump, (*a*) to the boiler-furnaces or a special furnace to be burned, (*b*) through special washing and absorbing towers, or (*c*) through oxide heaps or purifiers coming under this classification. An interesting paper on this subject was read before the Society of Chemical Industry, by J. Craven and W. H. Coleman, some time ago.*

Receivers for Fractions.—Any suitable tanks or old boilers may be used for this purpose. Some works employ specially made tanks of a size just sufficient to contain one of the various fractions worked off a single charge of tar; others use large flat-ended or egg-ended boiler-tanks. All the contents are removed from the receivers (*a*) by suction mains connected to a pump, or (*b*) by

* "JOURNAL," Vol. CX., p. 867.

* See "Journal of the Society of Chemical Industry," 1901, p. 200.

compressed air. In the later case, the receivers are built so as to enable the workmen to seal them completely. It is necessary to keep all openings in the receivers covered, to prevent loss by volatilization and the escape of foul gases.

Pumps for Transporting Oils and Tar.—There are various types of pump suitable for work in a tar distillery. Among these are the Evans-Cornish, Tangyes, Worthington, and Cameron pumps. In fact, any good make of pump fitted with piston or mitre valves will be found suitable. Some tar distillers employ an air-compressor, and transport practically all their liquid materials by the aid of compressed air. For carbolic and cresylic acids, and for caustic soda, this is by far the best plan.

Pitch-Coolers.—Cylindrical or square tanks or brick chambers are used to cool the pitch in before running to the pitch bay. The cylindrical type are the most common, and no doubt are the best to use. One cooler is provided for each still, or one for three or four stills, according to the quantity of pitch made. Each pitch-cooler is provided with a manhole, a manlid-stool, and lid, an inlet-pipe stool, an outlet-valve of the "treacle" or lever-plug type, and an outlet for connecting up to the foul-gas main. A form of pitch-cooler known as the "French Wier" is an excellent one, but is not at present used to any large extent in this country.

Pitch-Bay.—This is situated next to the coolers and below them, and is usually a brick or concrete lined pit; the depth and shape varying in different works.

Storage-Tanks.—These vary considerably both in shape and size. Tanks holding 1000 gallons to 800,000 gallons are now in use. They are generally made of wrought-iron plate; but some are made of cast iron, and others of reinforced concrete.

Process of Distillation.

Fuel.—Tar-stills are fired with (*a*) coal, (*b*) coke, and (*c*) producer gas. Coke is generally used in those cases where, calorific value compared with price, it is cheaper than coal, or when it is desired to use the furnace gases in some other process carried out in the works. Coal is the chief fuel used; producer gas coming second. By the use of producer gas, the operation of distillation can be controlled somewhat easier, and the risk of smoke prosecution brought about by careless workmen obviated. There is, of course, the question of cost; and taking all things into consideration, it appears that producer-gas firing is cheaper than coal firing. Less men are required to work a battery of stills if the former fuel is used; and the extra cost of the coal consumed per ton of tar distilled is small—not sufficient to neutralize that used in labour (*e.g.*, in one case the extra cost for coal when using producer gas approximated 0·48d. per ton of tar distilled, while the cost of extra labour when the furnaces were coal-fired approximated 0·84d. per ton of tar).

The object of distilling coal tar is to increase its usefulness, and therefore its commercial value. Broadly considered, the process of distillation is the same in all works. It differs only in certain details—such as (*a*) method of testing for the "cut" or "change-over point" for each fraction, (*b*) the number of fractions a certain tar will yield, (*c*) the desire to manufacture special products from the fractions, (*d*) the quality of pitch desired, (*e*) whether it is required to make special preparations from partly distilled tar, and so on. It is, on this account, impossible in a short paper of this nature to furnish a detailed account of the process of distillation as now carried on in the industry. A general description will, therefore, be given.

Assuming that the still and preheater are properly charged, all connections made, and the condensing-worms and the mains to the receivers perfectly clear—*i.e.*, not choked up with naphthalene and anthracene salts—firing is commenced. Extra care is used during the whole of the first, or crude naphtha and liquor, stage, in order to avoid "priming" or boiling-over of the tar. In an hour or so after the commencement of the firing (the time depending upon the size of the still), the tar will be thoroughly heated through; and as soon as the first drops of the distillate appear at the worm-end, the fire is slackened a little. The distillation is now proceeded with with caution, as it is at this stage in the operation that the tar generally boils over or "primes." Should this unfortunately happen, damping the fire and playing or else pouring cold water on the dome of the still will very soon stop it.

This fraction consists of ammonia water and crude naphtha; and these two liquids are passed, *viâ* the collecting-box, into the divider, where the water sinks to the bottom and is removed by the syphon-like pipe to the liquor main, and thence to a receiver, while the oil which remains on the top is run to the main leading to a naphtha receiver through an outlet near the top of the divider, as already described. As time goes on, the quantity of water in the distillate decreases—the oil, of course, increasing. It is yet necessary to continue careful firing, though the temperature can be raised a little. Towards the finish of this fraction, the water will change in colour from a greenish-yellow to a blood-red. Shortly after this change, the specific gravity of the oil running from the worm-end will stand between ·950 and ·955; and at this point, or at a point pre-arranged by the manager, the distillate is turned from the crude naphtha receiver into the light oil receiver—the distillate being "cut." In those works which use a thermometer, the "cut" temperature varies between 180° and 190° C. The water in the condenser-tank should be kept cold during the whole time this fraction is passing.

Soon after the change over, the distillate will begin to run from the worm-end in a moderately thick stream, and practically free from water. The fire is gradually increased, in order to keep the distillate running at an even rate. The flow of water through the condenser-tank is stopped, and that in the tank is allowed to gradually warm up by absorbing heat from the distillate as it passes through the condensing worm. It is necessary at times to bring the temperature of the water up by the aid of open steam conducted into the tank by means of a steam-pipe having an open coil at the end, which is able to rest on the bottom of the tank.

As the process continues, the amount of naphthalene salts in the distillate increases, and it is necessary to keep this material from crystallizing out and choking up the worm; hence the necessity of keeping the water in the condenser-tank at an elevated temperature. When the oil running from the worm-end reaches a specific gravity between 1·000 and 1·010, or, if a thermometer is used in the still, the temperature stands at between 210° and 215° C., the distillate is at once turned into another receiver. This fraction is known as light oil.

The distillate now begins to appear yellower in colour; and the smell of sulphuretted hydrogen, &c., gets stronger. The fire under the still is further increased; and the temperature of the water in the condenser-tank is allowed to rise. The point at which the distillate is "cut" to make this fraction—known as carbolic or middle oil—varies in almost every works. In those which use a thermometer, it is sometimes stopped between 230° and 240° C.; and where the "cut" point is determined by specific gravity, between 1·020 and 1·025 at the worm-end. Towards the end of this fraction, the oil generally shows a great tendency to set solid on cooling, due to naphthalene salts.

As the process continues, the distillate gets much yellower, the odour stronger, and the tendency to set solid on cooling sometimes decreases. This fraction, which is known as creosote oil, is stopped at a temperature of between 260° and 270° C., or at a specific gravity at the worm end of between 1·050 and 1·055. At this point, the distillate is turned into another receiver.

The process of distillation has now reached a point where it is necessary to allow the water in the condenser-tank to boil; and it should be brought up to this temperature, if necessary, by the aid of live steam. The distillate, as it runs from the worm-end, has a greenish-yellow colour, and appears viscid. The odour is generally very strong of sulphides; and it is necessary to see that the foul-gas mains, &c., are in good working order. As distillation proceeds, steam is introduced into the still, and the fire slackened. The point at which steam is introduced varies according to the tar being worked, and has to be found by experience. The introduction of steam helps to lengthen the life of the still bottom by reducing the tendency of the pitch to coke. It also reduces the time required for distillation, and, if carefully managed, increases the yield of oil. The passing of steam is continued until the finish of the distillation, which is determined according to the quality of pitch required—*i.e.*, soft, medium, or hard, or any intermediate quality. The finishing point has to be found by experience; and it is necessary to vary it frequently according to the quality of the tar being distilled.

The residue in the still—pitch—is allowed to remain for several hours before running into the cooler. This is necessary in order to minimize the risk of damage to the still and brickwork owing to the great heat stored up, to put less strain on the cooler (should this be of metal), and also to reduce the danger of the pitch taking fire. After the necessary time has elapsed, the pitch is run into the pitch-cooler, *viâ* the tail-pipe and discharge cock, and the empty still allowed to stand a further length of time, varying in extent according to whether or not a preheater is fitted to the still. If the former is the case, the time need not be long, as the tar in the preheater is already hot. To run cold tar into a hot still would not only start the rivets, but the danger of explosion would be extremely great.

It should be remembered that the stills will require cleaning—*i.e.*, the coked pitch scaled off the bottom and lower portion of sides—after they have been worked a few times. The formation of this scale is due partly to the heat retained in the brickwork surrounding the still coking the thin layer of pitch left in the still at the end of the "running off" operation, and partly to "free carbon" which deposits and adheres to the bottom during the first and intermediate portions of the operation of distilling.

The pitch is allowed to remain a number of hours in the cooler, after which it is discharged into the pitch bay, where it remains until it becomes quite cold, when it is broken up by the aid of hammers and wedges, and placed in railway waggons or carts for dispatch. When the pitch is first run into the coolers, the foul-gas main should be put into action, in order to draw off the acrid vapours and thus avoid a nuisance.

In the short time at my disposal it is not possible to deal with the subject of working-up the various fractions. It must suffice, then, to state briefly what they are worked up into. Considering the first fraction, the ammonia water is converted into ammonia or its salts, and the crude naphtha split up into the various grades of benzol, phenols, and pyridine bases. It also contributes a little towards solvent naphtha. The second fraction—viz., light oil—is split up into solvent and the other grades of naphtha, phenols, bases, and some creosote, and perhaps a little naphthalene. The middle oil—or carbolic oil—is treated to recover carbolic acid, cresols, and naphthalene, and sometimes bases. It also adds its quota to creosote. The creosote fraction is usually dealt with as it comes from the stills; but sometimes the naphthalene salts it contains is separated from it. The last fraction—anthracene oil

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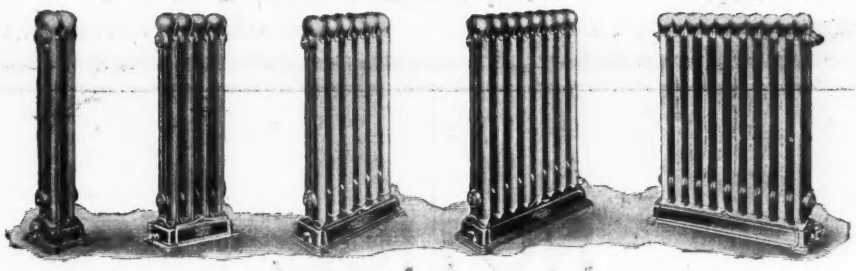

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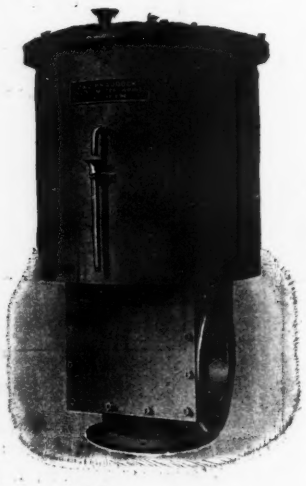

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—is sometimes worked for the anthracene it contains, and at others mixed with the creosote fraction and sold as creosote oil.

The PRESIDENT (Mr. R. S. Ramsden, of Burton-on-Trent) remarked that Mr. Warnes had given them a comprehensive paper; but possibly there might be some points on which the members would like further information.

Mr. P. C. BALCON (Birmingham) said he was rather sorry to see that the author had not dealt more with the various types of tar obtainable from the different systems of gas production. It would have been extremely interesting to have heard whether he had had any experience with the distillation of vertical retort tar, or tar from chamber systems of carbonization. The tars obtainable from such plants were very different in specific gravity and composition from those which resulted from coal carbonized in ordinary horizontal retorts.

Mr. WARNES said he was afraid he had had no experience with the tars to which Mr. Balcon referred. It was rather early in the day to ask for the experience of tar distillery managers generally in this connection, for as yet it was only the fate of a few to possess it. He did not know how long it would be before Birmingham put in plant of the description named. At other places where he had been previously engaged, they worked up the ordinary horizontal retort tars. He wished he could get some vertical retort tar, because it contained very little free carbon; and free carbon was, of course, a great nuisance in many respects. The price of pitch was to a certain extent affected by the presence of free carbon; and then there was the serious action of free carbon in connection with the burning-out of the plates, and other troubles he had mentioned in his paper.

The HON. SECRETARY (Mr. G. C. Pearson) said that they were greatly indebted to Mr. Warnes for having prepared his paper at very short notice. There was a Council meeting about the middle of September; and it was found necessary to somewhat re-adjust the rough programme which had been drawn up. It was then decided to ask if he would prepare his paper for the first meeting of the session, which meant that he had about a fortnight in which to write it. The paper was a useful one to them; and it was the work of an expert. He proposed a hearty vote of thanks to Mr. Warnes.

Mr. F. J. WARD (Knowle), in seconding the vote, remarked that he was sure Mr. Warnes would rightly understand the reason why there had been really no discussion on his paper. There were very few tar distillers in the district, and gas managers generally were not in the habit of distilling their tars. Personally, he had had some experience of the matter at a Yorkshire gas-works. His connection with the work was somewhat limited; but he watched what others did. He could follow the paper with a certain amount of attention, because some of the things mentioned he had himself noticed particularly. It seemed that a new Act was passed in 1906 which prevented open cooling. At the particular works to which he had referred, the cooling was a perfect nuisance. It was impossible for anyone to live in comfort within 200 or 300 yards of the gas-works. But apparently now this would not be the case.

The vote having been carried with acclamation,

Mr. WARNES said it had been a pleasure to read the paper. He would have liked more discussion, and would have been pleased to answer such questions as he might have been able. Of course, it was impossible to give every detail; but the facts and figures he had included in his paper were all correct. Perhaps at a later date he might be able to give the Association some particulars as to the working-up of fractions.

Lectures on the Law Relating to Engineering.—The Council of the Society of Engineers (Incorporated), in conjunction with the Council of the Junior Institution of Engineers, have arranged for a course of six lectures on "The Law Relating to Engineering," to be delivered by Mr. L. W. J. Costello, M.A., LL.B. (Cantab), at Caxton Hall, Westminster, at 7.30 p.m. The first was fixed for last night; and the rest will be delivered on the following dates: Oct. 25, Nov. 9, Nov. 21, Dec. 7, and Dec. 19. At the close of each lecture, opportunity will be given for the asking of questions and for discussion. The lectures are not free; but the fees for admission may be learnt on application to the Secretary of either of the Societies named.

Students' Catechism on Book-keeping, Accounting, and Banking.—We have received from Messrs. Butterworth and Co. a work bearing the above title by Mr. F. Davey, A.S.A.A. It is based upon a new system of instruction, and is specially designed to enable anyone to acquire a practical knowledge of book-keeping, and to learn at the same time how to answer questions on the subject. It is composed of graduated and classified questions and answers so arranged as to form an easy, systematic, and complete course of instruction, and is the outcome of the author's experience of the requirements of students attending commercial classes. The work is intended to serve as a guide to all examinations in book-keeping and accountancy; and suitable materials for class instruction and practical work are provided in the appendix, which contains a graduated course of exercises and examination questions. The book covers a wide field of practical knowledge, and should appeal not only to students, but to all who are interested in commercial affairs and wish to acquire a useful knowledge of accounts with the least possible expenditure of time and trouble. The price is 3s. 6d.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Opening Meeting for the Session of the Western District Division of the Scottish Junior Gas Association was held in the Technical College, Glasgow, on Saturday evening, and was very well attended.

Mr. D. CURRIE (Stirling) the retiring President, in commencing the proceedings, said that all that remained for him to do was to again thank the members for electing him to the position, and for the support they had given him during his term. He could assure them that the holding of the office had been a very pleasant experience to him; and he had benefited greatly by his occupancy of the chair. It was not necessary for him to introduce the new President, Mr. Fraser, as he was well known to almost every member of the Association; and, taking everything into consideration, he thought they were most fortunate in having him as President.

Mr. J. FRASER (Provan), on taking the chair, expressed his thanks to the Past-President for the courteous manner in which he had introduced him, and to the members for their reception. He then explained that the Vice-President (Mr. A. Kellock, of Alloa) had received an appointment at Pontefract, and it would therefore be necessary to elect someone in his stead.

Mr. F. Cuthbert (Kirkintilloch) was unanimously appointed Vice-President.

To fill two vacancies upon the Council, Mr. J. Wilson (Falkirk) and Mr. A. Wright (Greenock) were elected.

PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his address. Taking for his subject "Some Rambling Statements about Progress by a Gas-man," he made the following remarks.

PROGRESS OF THE GAS INDUSTRY.

Regarding the rapid progress that gas has made within the last few years, a great amount of credit is due to the renowned countryman of our City's guests of the past two days—viz., Dr. Welsbach, who by his perfect incandescent mantle gave to the gas industry an impetus which it very much required, and which came just at the proper time, since many of us know that it was then considered doomed. But what a revival was in store! With the bunsen flame harnessed for lighting purposes came the reduced candle power, and as a consequence the use of a cheaper class of coal. This enabled gas undertakings to sell their gas at a greatly reduced price, which encouraged those who required power in a small way to instal gas-engines, the reduced price of gas making it permissible to do so. Cheap gas is also responsible for the great increase in the number of cookers and other gas apparatus and appliances which are now in use wherever there is a supply of gas. While this great transformation was taking place on the outlet side of the governor, let us look at the works and we shall also find a transformation just as great. The reduced candle power and the cheaper class of coal are two items in the long list of improvements and alterations which are responsible for the cheap gas of to-day. Mechanical stoking falls to be added to this list, as in large works it played a very important part at what we are inclined to call the critical period in the history of the gas industry. While in large and small works alike the system of heating, carbonizing, and purifying underwent great changes, yet, with all these changes to meet modern requirements, the inventive genius of gas engineers has not stopped, as the undreamt-of results obtained from the various kinds of vertical retorts at work prove that when this type of retort is fully developed—and it is being developed daily—gas will be sold at a price that will astonish even gas managers.

HEATING RETORTS.

In dealing with the progress of the industry, the cheapness and utility of gas, and the means by which the changes affecting its progress were brought about, I consider the heating of the retorts as of first importance. "How are your heats this morning?" is a question that is invariably asked by all gas managers on their arrival at the works; and little wonder, as heats play such an important part in the results obtained. Producers of various types are now recognized by all gas managers as the proper system by which to heat retorts; the old method of direct firing being almost, if not quite, wiped out. Of the various types of producers in use, I intend to confine my remarks to those with which I have had personal experience. These comprise three types—external, internal, and the outside gaseous producers as installed at the Provan Gas-Works. I shall begin with the external steel caisson brick-lined producer known as the Siemens, which gives good results so far as heating is concerned; its greatest fault being its large wages bill. (See Table I.) Next we have the internal producer well known to most of the members. This type of producer has played a very important part in the progress of the industry, having been the means of reducing the cost of labour wherever it has been installed. (See Table II.) Then we come to the outside gaseous producer, for which I claim greater efficiency and economy over every other system known to me for heating settings of horizontal retorts. (See Table III.)

TABLE I.—*Siemens Producers.*

	Firemen's Wages for 24 Hours.
22½ potmen, at 5s. 3d. each	£5 18 2
22½ ashmen, at 4s. 9d. ,,	5 6 10
	£11 5 0
Total wages paid from coal-hopper to coke-bing	£26 6 6

Coke used for fuel, 3·79 cwt. per ton of coal carbonized. This equals 32 per cent. of coke produced per ton of coal.

TABLE II.—*Internal Producers.*

	Firemen's Wages for 24 Hours.
9 potmen, at 5s. 3d.	£2 7 3
9 ashmen, at 4s. 9d.	2 2 9
3¾ potmen, for cleaning, at 5s. 3d.	0 19 8
3¾ ashmen, ,, ,, at 4s. 9d.	0 17 10
	£6 7 6
Total wages from coal-hopper to coke-bing	£23 9 6

Coke used for fuel, 3·75 cwt. per ton of coal carbonized. This equals 31·66 per cent. of coke produced per ton of coal.

TABLE III.—*Outside Gaseous Producers.*

	Firemen's Wages for 24 Hours.
3 producermen, at 5s. 3d.	£0 15 9
6 assistants, at 4s. 9d.	1 8 6
	£2 4 3
Total wages from coal-hopper to coke-bing	£14 9 2

Coke used for fuel, 4·21 cwt. per ton of coal carbonized. This equals 36 per cent. of coke produced per ton of coal.

VALUE OF GASEOUS PRODUCERS.

In the tables I have dealt with 360 retorts, 9 feet long, in all my comparisons—this being the full load for six producers; and as this number is all connected direct to one main gas-flue, they are practically as one. I have also done so to show at a glance the saving in wages effected by one system over the other, and also the percentage of fuel used. Table II. shows the results to be in favour of internal producers over the Siemens system—a saving of £4 17s. 6d. being effected in firemen's wages, while the fuel is almost the same. Table III. shows a further saving of £4 3s. 3d. for gaseous over internal producers. Against this we have an increase in the coke used for fuel from 32 per cent. for internal to 36 per cent. for gaseous producers. This at first sight seems rather alarming; but it in no way shakes my faith in the latter class of producers, as the money saved in wages more than equals the amount that would be realized by the sale of the extra 4 per cent. of coke used for fuel.

Another point which I should like to emphasize is that, in estimating the percentage of fuel, one should never lose sight of the coke value, as estimates are given from many places which appear to be very low compared with others; but when the percentage of ash is taken out, it puts quite a different aspect on the subject. We have instances of works reporting their average ash test as low as 5 per cent., while others report it as high as 12 per cent. Therefore, in making comparisons, we should take the difference in percentage, and call it coke. I consider this is proper, as we are dealing with the percentage of coke and not its value; and the value determines the per centage used for fuel, in this respect—that if coke has a low percentage of ash you will require less for fuel than if you had one with a high percentage to get the same heating value. What I claim is that, knowing the ash percentage to be high, this apparent saving of 4 per cent. in coke with the internal producer is not the last word in economy. Especially is it so when one takes into consideration the steadiness at which the heats can be maintained by gaseous producers; thus preventing the great contraction which takes place while clinkering and the expansion which must follow in settings heated by internal producers if the heat is to be brought up with any degree of rapidity. You have these fluctuations while clinkering internal producers, while there is no such thing with gaseous producers, as with six at work there is only one off at a time for cleaning. Each producer is cleaned once in 24 hours; the cleaning taking about 45 minutes to complete, during which period the even pressure of 3-10ths is maintained in the gas-flue by giving the other five producers a little extra to do.

The beneficial effects of an even temperature have been brought home to us at Provan by the extraordinarily good condition in which we find our settings after they have been at work over long periods, as follows:—

No. 2 Bench.

On Sept. 30, 1904 to Off Feb. 13, 1907	868 days.
On March 23, 1907 to Off Feb. 19, 1908	334 ,,
On April 30, 1908 to Off July 2, 1909	438 ,,
On Sept. 14, 1909 to Off June 30, 1910	289 ,,
Total	1929 days.

1929 days ÷ 365 = five years and three months.

The period during which the bench was out of action for repairs was:

	Months.	Days.
First	1	10
Second	2	10
Third	2	12
	6	0

First time under fire, Sept. 30, 1904 to Last time let out, June 30, 1910 = 5 yrs. 9 m.

This table shows the actual dates on which the bench was put under fire and when it was put out; and when I tell you that the original regenerators and 68 per cent. of the original retorts are still in position, and that the bench was put under fire ten days ago to do a winter's work, without a new retort or piece of one being added since it went off in June last, you will probably be considerably astonished. The retorts were simply patched up and pointed, so as to allow us to run it to a finish in about six months' time.

From these facts, I think it must be admitted that the gaseous producer is all that I claim for it, for had this bench been heated by internals, the retorts and regenerators would have been renewed a long time ago. What I have said makes it quite clear that the apparent saving in fuel would have long since been swamped by the cost of material and the wages paid for renewals; thus proving that the gaseous producer is another step towards progress.

CARBONIZATION.

Next in the line of progress comes carbonization; and it is in the retort-house that we are led to understand by many authorities that the difference between profit and loss occurs. This argument is certainly true in many respects, as, by injudicious stoking, money can be thrown away with every pound of coal carbonized. On the other hand, by having a good system and careful supervision, this loss can be avoided, and every pound of coal made to yield every cubic foot of gas it contains. The question of light charges and a short period of carbonization or heavy charges and a long period is one that has been asked before this and kindred Associations on many occasions, and has never failed to create a healthy discussion, which it well merited, as it is a question fully worthy of great consideration and fair trial. Any alteration of an established system of doing a certain piece of work is often resented by those required to perform it. Consequently, many good ideas for improving both method and labour are never realized. The system of heavy charges over long periods is, I believe, an improvement both in method and labour, as the results obtained are satisfactory to the employer and beneficial to the employee.

A little more than two years ago, the period of carbonizing at Provan was four hours; the weight of charge per retort being 2·64 cwt. The coal carbonized per retort in 24 hours was 15·84 cwt.; the make of gas per retort, 7710 cubic feet; the make per ton, 9702 cubic feet; and the illuminating power 17·31 candles, tested by the flat-flame burner. After a period of experimenting as to time and weight of charge, the best results were found to be obtained from charges of 4 hrs. 48 min. duration; the results being as follows: Weight of charge per retort, 2·95 cwt.; coal carbonized per retort in 24 hours, 14·75 cwt.; make of gas per retort, 8099 cubic feet; make per ton, 10,915 cubic feet; illuminating power, 18·32 candles, tested by the No. 2 "Metropolitan" burner. The full value of the 4 hrs. 48 min. system does not end in the results obtained from the distillation of the coal. It has at least one other virtue, which the men in our retort-house were quick to observe. The introduction of 48 minutes' longer burning meant a readjustment of the time at which the retort would be drawn and charged. In short, it meant only five charges per day of 24 hours, against six under the old system. This, along with the readjustment of the time for drawing and charging, gave the men better facilities for taking their meals and attending to things in general (the plant included), since it allowed more time for the proper execution of necessary repairs to the stoking machinery, &c. I might also mention that the lives of the machines have been increased by this lessening of their labours.

PURIFICATION.

The progress in purification achieved by the introduction of mechanical scrubbers and washers for the purifying of coal gas is well known to all of us. In the final stage of purification, I consider that oxide of iron should be more favoured than it is. Possessing as it does the two great factors in competition—cheapness and utility—its more general use would, in my opinion, enable gas managers to still further reduce the price of gas without in any way lowering its value as a heating agent.

THE GLASGOW EXHIBITION.

While speaking of progress in connection with the gas industry, I cannot allow to pass unnoticed the wonderful exposition of gas appliances which we have had with us in Glasgow for the last three weeks. The practicability, the charm, and the excellence of the exhibits I am sure surpassed the imagination of many; and great credit is reflected on those who were responsible for bringing together so magnificent a display. This exhibition, through the generosity of Mr. Alexander Wilson, the Gas Engineer and General Manager to the Corporation of this city, we have all had the opportunity of seeing for ourselves; and I am sure I express the feelings of the members when I say that we are all greatly

indebted to him for his thoughtfulness. Let us hope that the exhibition will bear fruit equal to its blossoms, by increasing by leaps and bounds the output of gas in Glasgow and the surrounding district. Every thousand cubic feet of gas consumed for heating purposes will tend to show that Glasgow's Smoke Abatement Exhibition has served well the purpose for which it was intended—the production of a purer atmosphere.

THE PRESENT POSITION OF THE GAS INDUSTRY.

The progress of the gas industry of late years is seen from the large amount of money handed over annually by the various corporations throughout the kingdom in relief of the rates. This is a system which should be abolished, and more consideration given to the gas consumers and the producers of the money. In my opinion, the changes to which I have referred in the course of my remarks are responsible for the sound financial condition of the industry; and I consider that those who, by their energetic labours and attention to duty, were the means of keeping the industry in the premier place as an agent for heat, power, and light, are worthy of more consideration than they receive from those who are in a position to give, as it is only by paying for ability that you can obtain it, and by so doing hold out some inducement to men who have spent years in the study and practice of the one subject they have at heart—the gas industry—to continue their efforts to maintain it in its position.

Discussion.

Mr. D. Vass (Airdrie) said the excellent address to which the members had listened was one which not only those present but the gas profession throughout the country would study with interest. The economy shown as the result of outside producers was an eye-opener. Many of them had heard that this type of producer was very extravagant in working, swallowing up a great deal of fuel; but the figures now given brought out an economy which would surprise them. The question for them now would be how far they could narrow down outside producers to meet the needs of smaller works. It was a foregone conclusion that in large works they were a decided success, both economically and financially. From the point of view of durability of the retorts, they had there a very strong case. They had been hearing, during the past year or two, about the great length of time a retort made by the Germans would stand; but he thought when they looked at the figures in the address there was much to be said, when they talked about the life of a retort, of the conditions under which it was worked. There they had retorts lasting five years. They found that Scottish makers could produce retorts that would last almost as long as they would like, as one maker had said, "when they were agreeable to pay the price for them." He thought the President did well in drawing their attention to what had been done in Glasgow during the past three weeks. He had no hesitation in saying that in the Smoke Abatement Exhibition they had the best collection of gas appliances that had ever been placed, anywhere, before the public. He considered Glasgow had done a great work, not only for themselves, but for all, in bringing together such a collection. He himself was not slow in making it as well known as he could in his own district; and he knew that other gas managers had done the same. They all hoped to benefit by the exhibition. A few days previously, he happened to make use of almost the same words as the President had used regarding electricity, when, in speaking to an employee of the Electricity Department in their district, he (Mr. Vass) said there was room enough for them both. That official's duty was principally to canvass for business. He said he did not take the same view; but that, in his opinion, there was only room for one, and that his was the one. If this idea was to be held by their rivals, it was time that people in the gas industry were awakening, and adopting the view that if there was only room for one, that one was gas. They ought to push their business with all the vigour they could, for this was the only way to extend it.

Mr. A. Smith (Tradeston) said, as one of the Station Managers in Glasgow, the portion of the address which had appealed to him most had been that which had referred to the heating of the retorts. The President had shown them clearly the economy of outside producers. No doubt internal producers had been a great advance upon those on the Siemens system; but there was always this to be said about them, that when cleaning was going on cold air got in and destroyed the settings. The life of the retorts could be considerably prolonged, as the President had shown, by the use of outside producers; and the question was how they could be adapted to existing works and to small works. The President had not said anything about the capital expenditure which an installation entailed; and he (the speaker) did not know how this would work out.

Mr. W. Grafton (Glasgow) said the part of the address which touched him most was the brief reference to the vertical retorts at Provan. He thought a good deal more might have been said in praise of them, not, perhaps, with regard to figures, but to their simplicity, and to the fact that they were one of those things which did a great deal in the way of smoke abatement. The quantity of smoke given out from an installation of vertical retorts was very small; and at the same time there was more gas, as well as better coke and other products. Some contended that vertical retorts were against the interests of the workers, because fewer men were employed. This might or might not be true; but the work was decidedly lighter and easier for them. With regard to their general working, very much could be said. Some were against, and others for, them. It remained to be seen what the Glasgow vertical retort would do during the next few months. At the Helensburgh Gas-Works they were adopting them. They hoped the Junior Gas Association would be able to visit that town and see the retorts at work; and he was sure their worthy Manager—Mr. Blair—who was present, would be the first to welcome them. Not one or two, but many, of their German visitors commented upon the uniformity of the heating of the retorts which was obtained at Provan. Not only at one part of the bench, but everywhere, and at the far end, which was always the most difficult to heat, the heat was the same. When they took into consideration that there were twelve retorts in these settings, and bore in mind the difficulty there was in heating twelves—and this was a point that was noticed at Provan—the uniformity of the heating was the more striking. Great credit was due to Mr. Webster for the able way in which the vertical retorts were worked.

Mr. W. Blair (Helensburgh) said it was well known among practical men that with a good system of gaseous firing they could keep up a uniform heating of the retort during its life. The question was as to getting as good results with small units. Some of their Irish brethren had side producers, and heated the ovens practically on the same principle as they did with outside producers; and very remarkable heating it was. He questioned whether much better heating was being obtained in the gas-works in Glasgow. The great difficulty with regenerative settings was the cleaning out of the furnaces. If they could get away from choked ascension-pipes and cold air, they might run their retorts up to 2000° or 3000° Fahr., whereas at present 600 or 700 days of actual working were about the lifetime of a retort. He should like to acknowledge the great advantages they had all derived from the Smoke Abatement Exhibition. It had been a considerable pleasure to him to attend it. He had had the opportunity of seeing nearly all the methods of firing vertical retorts, and he believed that the continuous system was the one of the future. When their vertical retorts were in operation at Helensburgh, he would be delighted to welcome the Association to see them.

Mr. S. B. Langlands (Glasgow) said that many years ago that "grand old man" of the gas industry, Mr. George Anderson, introduced side producers, which gave very good results. They were certainly the forerunners of the outside producers. As to the marvellous results that were being obtained in small works, where the means at their disposal were small, he was told that in one works, a long way farther from the coalfield than Glasgow, they were making gas at 1s. 2d. per 1000 cubic feet. Of course, there was something behind this. It was a question as to what they put into the manufacturing costs. Till they had a standard method of making up manufacturing and distribution costs, the matter would never be satisfactory. Their rival, the electricians, unlike themselves, placed everything to capital, and put off to the farthest day the redemption of the capital. He considered that the profit upon the gas sold in a house of ordinary size, for lighting, cooking, and heating, was sufficient to justify them in furnishing the means for using the gas; and yet the Corporation grudged consumers a stove. To his own mind, a stove should be reckoned as part of the gas-works plant, just as a meter or a holder; for it was a means of distribution.

Mr. D. Currie (Stirling) remarked that the President had proved that outside producers were the most profitable—at any rate, at Provan. The figures given in the tables proved conclusively that they paid in large works. He noticed that the consumption of coke was higher with these producers; but no doubt this was due, to a great extent, to the radiation in conveying the gas from the producer to the retort-bench. With outside producers a retort-house was much more comfortable, and could be better supervised. He gathered from the address that they put a charge of about 3 cwt. in a stop-end retort. In Stirling, they should consider this a light charge. In a through retort, which was equivalent to two stop-end retorts, they put in from 10 to 12 cwt. of coal. They had invariably eight-hour charges; and they were able to maintain the illuminating power of the gas. Of course, they had to enrich with benzol; but it paid them to do it. They got as large an average yield as 11,800 cubic feet per ton of coal; so that it suited them to work a very heavy charge. In so doing they saved a lot of money in wages; and the work on their machinery was much lighter. In the event, for instance, of a breakdown, they had time to repair the machinery; whereas with short charges there would be only time to patch it up.

Mr. W. M. Mason (Glasgow) considered that the President's text of "Progress" was a most admirable one. He believed that gas was only getting on to its feet. It had been proved by the Smoke Abatement Exhibition that, instead of gas being a dying business, electricity had not a chance beside it. People who visited the exhibition, and saw the two things side by side, went away convinced of the superiority of gas. That evening a leading member of the Electricity Department admitted to him that gas was the thing for universal use. The President was a practical man, interested in the producer side of their business. But in the future the side in which there would be scope was not the production but the distribution side. The Smoke Abatement Exhibition had shown that there was abundant room for the whole of them.

Mr. D. Fulton (Glasgow) considered that while it would be useless to deny that outside producers gave results far better than internal ones, the tables in the address hardly did justice to the latter. The President made out firemen's wages, with the

internals, to be 5s. 3d., and a total of £23 9s. 6d.; with outside producers, the wages were £2 4s. 3d., and the total was £14 9s. 2d. There were no internal producers in Provan, and it did not require a Sherlock Holmes to discover that the figures as to internals applied to Dawsholm. He wished to point out that the internal producers heated only eight as against twelve retorts; but they received two more charges in a day, so that they carbonized 17·15 cwt. of coal in 24 hours, as compared with 14·75 cwt. by outside producers. This, taking also into consideration the extra quantity of coke used with outside producers, made the advantage not so great as would appear at first sight. At Dawsholm they had two through benches fired by internal producers, and two similar benches fired by outside producers; and he might say that the heats were very much better with the latter, and the working costs were considerably less, even than in the internal producers with eights. Of course, they carbonized less coal with the internals. At Dawsholm they had one bench, built in 1903, fired by Siemens producers. The following year it was found to be necessary to put two 9-feet lengths into each oven. After this, very few repairs were required till last year, when five of the ovens required to be repaired. The regenerators were the same, and they got heats in the bench equal to those in any bench in the works.

The PRESIDENT, in closing the discussion, said he did not know what the first cost of the outside producers was, but he could get it by inquiry. He was certain, however, that, from the amount that was saved, the difference in cost, if any, would be overcome within twelve months at least. The quality of the coke from vertical retorts he was inclined to doubt, because he thought that coke from long-period carbonization was not quite so good as it was when coal was carbonized in short periods. Outside producers could not be applied to small works, as each producer heated 60 retorts. He quite agreed with Mr. Langlands as to the necessity for having a standard method for the making out of gas accounts. The members would observe in his tables that in one case the costs were from coal-hopper to coke-bing, and in the other it was to the railway waggon. In the one case the coke was dumped down, and had to be lifted again; whereas in the other it was loaded into waggons. The charges at Provan were pretty nearly 3 cwt. In eight hours they ran 11¼ cwt. It was being talked about by many at the head of affairs that more attention must be given to distribution; and he believed that the men who went round to consumers' houses should be given more scope in their work. They should be able to tell consumers the best way to use gas. He considered there should be some form of maintenance of gas-fittings. Some corporations undertook maintenance for a given sum per annum; and he had often wondered why such a system was not in existence in Glasgow, either in the hands of a company or the Corporation. There would be money in it. The argument in favour of the long period of carbonization was that they carbonized 18 tons 11 cwt. less coal than by the old system; but they gained 1213 cubic feet of gas per ton, which was equal to 33 tons of coal and 9702 cubic feet per ton. He thanked the gentlemen who had offered remarks upon his address, and said he wished to bespeak the hearty co-operation of all during the session now commenced.

The business then concluded.

REMOVING CORROSION FROM WATER-MAINS.

Among the applications for letters patent contained in the "JOURNAL" for the 24th of May last was one by Mr. R. A. Adamson, the Engineer-in-Charge of the Rivington works of the Liverpool Corporation, for the removal of corrosion from water-pipes. As readers are aware, one method employed in the past for effecting this object was to force a metal disc, slightly smaller than the bore of the pipe, along it by means of manual labour. By this means, about 50 yards per day could be cleaned; but it necessitated the employment of eight men. Another method was the use of a piston or plunger which scaled the main, and forced in front or dragged behind it scrapers formed of steel springs. By neither of these methods, however, was the pipe thoroughly cleared, as a ring of corrosion was left, which for some time afterwards affected the colour of the water. It is claimed for Mr. Adamson's system that by its adoption these defects are obviated, and the pipes are left with the black enamel lining practically untouched, and in almost as good condition internally as when they were laid. Mr. Adamson's specification has not yet been published; but we are able to give the following particulars in regard to it.

The apparatus consists of a petrol engine to revolve a bottom shaft. An opening of 9 feet having been made in the main to be cleaned, a bracket is fixed on each end of the opening. These brackets carry two rails and a coarse-pitch screw. The engine is then lowered into the hole in such a way that the wheels on the frame rest on the rails, while the screw passes through the centre of the machine. The bottom shaft is then central with the main. The frame of the machine is fitted with a hand-wheel to suit the pitch of the screw. By turning this wheel, the machine is propelled along the rails in either direction; the bottom shaft remaining central with the main in any position. A specially constructed knife, formed by means of a central bar carrying four cutters, is used for the scraping. Each cutter is held out by means of a spring, so that when the four cutters are extended, the knife is about an inch larger than the main. This allows for any inequalities in the pipe, such as a slightly oval shape—the knife opening or closing as required.

The knife having been inserted in the end of the main, the other end is attached to the bottom shaft of the machine. The engine having been started up, the driver turns the hand-wheel in the desired direction of travel; the result being that the revolving knife is gradually fed into the pipe after the manner of a boring-machine. The end of the frame having been reached, a similar knife is attached to the other end of the bottom shaft, and the hand-wheel is turned in the opposite direction until the other end of the frame is reached. A lengthening piece or rod is then fitted between the first knife and the bottom shaft, and driven up the pipe as before. This action is repeated backwards and forwards until the desired length is reached. In long lengths, it is possible to clean 200 yards in each direction, so that a space of 400 yards in all is cleaned from the one opening.

A small quantity of water is allowed to flow down the main both to wash out the dirt as the work proceeds and also to keep cool the knife, which is turning at some 80 revolutions a minute. The speed of work is about 50 yards per hour; but this depends largely upon the obstructions met with. In ordinary practice, it should be possible to average about 300 yards per day. After the cleaning has been done, the rods are drawn, and the valves opened full, so as to thoroughly flush-out any remaining dirt. It is found that ordinary bends can be driven round, as sufficient play for the purpose is left in the joints of the rods.

The machine has lately been inspected while in operation by members of the Water Committee of the Liverpool Corporation and a number of water engineers from surrounding districts. It is claimed for it that it is capable of doing in one day the work which would take eight men a week to perform; and it can be worked by three men. The saving in labour and time is consequently obvious.

A Reduction in Price at Wallingford.—A reduction in the price of gas from 3s. 6d. to 3s. 3d. per 1000 cubic feet has been made by the Wallingford Gas Committee. This is the third reduction within a short period.

Differential Gas-Rate for Belfast.—At the last meeting of the Belfast City Council, the Gas Committee submitted a recommendation that they should be authorized to charge a differential rate for gas for lighting and power purposes, also for additional borrowing powers; the extent of the difference to be arranged by the Town Clerk and the Cashier. Mr. Squire, in moving acceptance of the recommendation, said the Committee were anxious to increase the use of gas for power purposes; and there was scarcely a town in the United Kingdom which had not a differential rate. Councillor M'Cusker seconded the motion; and it was unanimously passed.

Additional Capital for the Redhill Gas Company.—From an announcement which appears elsewhere, it will be seen that the Redhill Gas Company are inviting offers for an issue of £5000 (nominal) of ordinary "B" stock, in sums of £10, or multiples thereof, at a minimum price of £101 per £100 of stock. The additional capital, which is required for the extension of mains rendered necessary by the continued development of the outlying parishes supplied by the Company, will rank for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; and the price at present charged for gas will permit of the payment of the standard dividend.

Berwick Water Supply.—Complaint of default having been made by a number of ratepayers against the Berwick Sanitary Authority in regard to the water supply of Berwick, Tweedmouth, and Spittal, a public inquiry in regard thereto was opened at Berwick last Thursday on behalf of the Local Government Board. The petitioners were represented by Counsel, and the Town Council and Berwick Wards Ratepayers' Associations by solicitors. The Associations who oppose the complaint contend that Berwick's present water supply is adequate; while the petitioners' case is that the needs of the townships should be met by a joint scheme. The inquiry was adjourned for some days.

The First Incandescent Gas Lights in Worcester.—A Worcester newspaper draws attention to the fact that it is just seventeen years since the first incandescent gas-burners publicly seen in the city were used for the lighting of one of the shops. The enterprising tradesman who acted as pioneer of the new system of illumination was a Mr. Skan. Quite a sensation was caused by the peculiar whiteness and remarkable brilliancy of the new lights; and Mr. Skan's example soon found imitators. In those days, incandescent burners cost about 15s., and the mantles 2s. 3d.; but, says our contemporary, "the value of the new method was so obvious that the cost did not deter go-ahead tradesmen."

Buying Gas Coals at Stockport.—There was a long and unexpected discussion at the meeting of the Stockport Town Council last Wednesday on the subject of buying coals for the gas-works. The minutes of the Gas Committee contained the following remark: "The Engineer submitted offers of 20 waggons of Wharncliffe nuts, and of 25 to 30 waggons of Garswood Hall nuts." Mr. Allcock, a member of the Committee, called attention to this matter, and said he did not agree with the way in which the coal in question was being purchased. It was not wise for a Corporation to buy "spot lots" in this way, because it opened the door to so many irregularities. They never could tell whether the coal was good, bad, or indifferent. The principle was wrong, and he did not care to have anything to do with it. He moved that the minutes be referred back. The Chairman of the Gas Committee (Mr. J. Fernley) defended their action, and said that though Mr. Allcock did not agree with the principle of "spot" buying, the other members approved of it; and he had no hesitation in saying that it was a distinct advantage to the gas undertaking and the ratepayers. In the result, the action of the Committee was approved by 25 votes to 14.

REGISTER OF PATENTS.

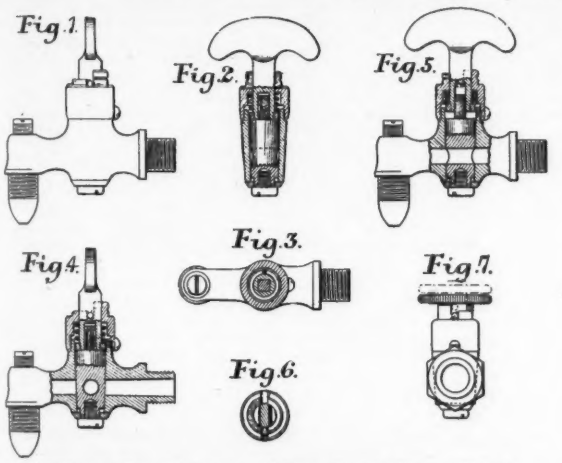
Taps and Cocks.

PARKINSON GAS-STOVE COMPANY, LIMITED, of Birmingham, and SPREADBURY, E. L., of Rochester.

No. 24,801; Oct. 28, 1909.

These taps or cocks are of the "safety" type, in which means are provided for automatically retaining the tap in its "off" or closed position and preventing it from being accidentally turned-on or opened. This is effected by arranging the shank or stem (to which the handle is attached) so as to be capable of being raised or lifted against the pressure of a spring, and providing the shank with a peg or like projecting part, which, when the tap is in its "off" position, is caused by the spring to engage within a notch or recess in the end of the body or a part attached thereto, thereby locking the tap in its closed position—it being necessary, before it can be turned on, to first raise or pull out the shank until the peg is disengaged from its notch.

Safety taps are known, the patentees point out, in which the handle is connected to the plug by a telescopic or pin-and-slot connection, and a coiled spring is arranged between the underside of the handle shank and the plug, so that the handle tends to be forced upwards or outwards—a pin being carried by the handle and working within a horizontal slot in the body; the slot having a short right-angled extension at one end. The arrangement is such that when the tap is turned into its "off" position the pin comes opposite to this extension, and the spring lifts the handle and takes the pin into locking engagement with the extension. In another form, instead of a pin working in a slot, the



Parkinson Stove Company and Spreadbury's Taps and Cocks.

handle has a flat which, when the tap is "off," comes coincident with the edge of a bar carried by the body, so that the handle can be raised by the spring and the flat taken into locking engagement with the bar. In both these forms, however, it is necessary to push the handle inwards in order to turn the tap on, whereas, according to the present invention, the handle is pulled out for this purpose; the spring being arranged between a cap fixed upon the end of the body and an abutment upon the inner end of the shank, so that the handle normally tends to be drawn inwards.

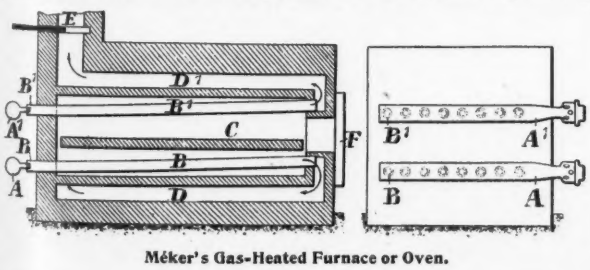
Fig. 1 is a side elevation of a safety cock for gas-cookers constructed in accordance with this invention. Figs. 2 and 3 are vertical and horizontal sections; fig. 4 shows the cock in its "off" position; and fig. 5 when turned full on. Fig. 6 illustrates the locking notches in plan. Fig. 7 is an end view showing the application of the invention to a cock for a gas-fire.

Gas-Heated Furnaces or Ovens.

MÉKER, G. A. H., of Asnières, France.

No. 28,633; Dec. 7, 1909. Date claimed under International Convention, Jan. 14, 1909.

In an oven or furnace constructed according to this invention, the gas is completely burned at the instant of its entrance to the circulating tube, or, at least, the flame has the necessary amount of air for complete combustion of the fuel, because each burner has its own air admission. The result of this is that the tubes contain only burning



Méker's Gas-Heated Furnace or Oven.

gases and hot products of combustion, while the burners themselves remain cool whatever the temperature in the circulating tubes.

The illustration shows a longitudinal section of the oven, and an elevation from the burner side.

A A^1 are sections of the burners, which may be of any suitable type. B B^1 are metal tubes whose diameter is in proportion to the size of flames produced by the burner—the flames being formed according to the result and the temperature to be obtained. In the present case, the tubes are shown arranged in two rows; one above and the other below the floor C, on which are placed the articles to be baked or heated. The tubes are placed in a slightly inclined position, and are (preferably) approximately straight—that is, they may be slightly curved or sinuous. The flames, on passing into the tubes, give up their heat to them; and the burnt and cooled gases arrive at their ends, where they are collected and sent to the chimney. Or as shown) they circulate through the channels D D^1 on their way to the chimney E. As required, the door F of the oven is placed on the most suitable side.

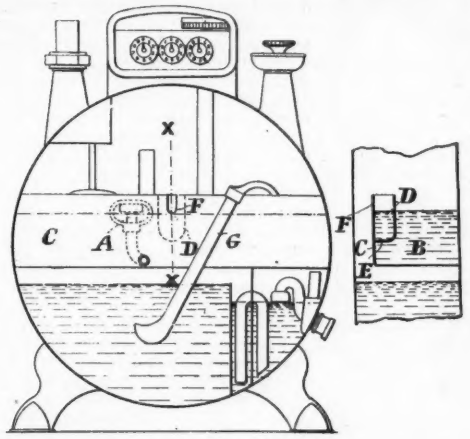
According to the operations to be carried out in the oven, the tubes may be arranged in one or in several rows; each row lying in a horizontal plane or on any surface of revolution whatever. The temperature required of each row of tubes is regulated by merely adjusting the consumption of the burner.

Gas-Meters.

COWAN, W., of Edinburgh.

No. 26,277; Nov. 12, 1909.

This invention relates to wet meters in which means are provided for elevating water from the waste-water chamber, so as to automatically maintain the water-level in the measuring chambers, and prevent changes of level, due to evaporation. In such meters, the patentee states, it "has not hitherto been found practicable to apply the syphon method of determining the water-level in the meter under atmospheric pressure, because such syphon was liable in some circumstances to be brought into action, while under pressure, so that the accuracy of measurement was liable to be upset." The present invention consists in providing means for the discharge of water at a small rate from the water-level adjusting space at a point about the syphon level, "which has the function of discharging at that level the automatic feed water, so that the latter cannot bring the syphon into operation."



Cowan's Wet Gas-Meter.

A transverse section through a wet gas-meter (of the spoon-feed type is shown; also a section on the line X.

The syphon A is of the kind described in patent No. 1665 of 1886, adapted to determine the water-level in the measuring chambers. This is placed in the front part of the water space B next the gas measuring chambers, the water-level in which determines that in the adjacent measuring chambers. In the side wall C of this front part (which overhangs the waste-water space of the meter), there is provided a pocket D with a small hole E in the bottom. The edge F of the pocket communicating with the tank is cut down to the water-level determined by the syphon when operated at atmospheric pressure. The diameter of the hole E must be so adjusted that it will discharge the quantity of water automatically fed by the spoon-feeding device G, so that when it has filled up to the syphon level, it cannot produce any further rise of level, and therefore brings the syphon A into operation. The quantity of water which this hole can discharge is so small that it does not interfere with the operation of the syphon when water is poured in at a greater rate—as happens in re-charging the meter with water at atmospheric pressure.

The device further "renders unnecessary the provision of an additional device to prevent the meter being improperly charged with such small quantities of water as would adversely affect the accuracy of measurement of the meter without operating the syphon."

Blast-Tube Burners.

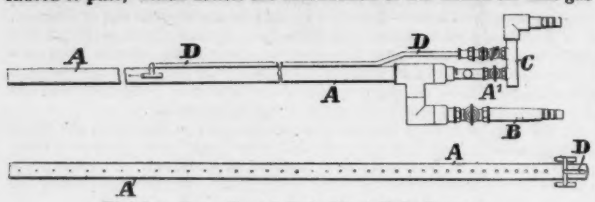
FLETCHER, RUSSELL, AND CO., LIMITED, and FLETCHER, T. W., of Warrington.

No. 4490; Feb. 23, 1910.

This invention relates to blast-tube burners as employed for heating calender rollers and the like. It has been found, the patentees state, that in the centre and the far end of the roller, owing to the confined area in which combustion takes place, the spent gases accumulate at the end of the burner-tube, "resulting in imperfect combustion, and the heat being unequally distributed." The object of the present invention is "to cause the heat to be more equally diffused along the length of the roller in which the burner is inserted, and to obtain improved results without any increase in the quantity of gas consumed."

In the side view of the device and part plan of same (p. 140), A is the ordinary blast-tube burner with air-regulating tap A^1; and B is the gas inlet to the tube in which the air and gas are mixed. Connected

to the air inlet C is an auxiliary air-tube D (with an air regulating tap). It extends along the top, or by the side, of the tube A to about the commencement of the jets in the tube; and at the end of the tube D branch nozzles are fitted through which an additional volume of air is caused to pass, which assists the combustion of the mixed air and gas



Fletcher, Russell, and Co.'s Blast-Tube Burners.

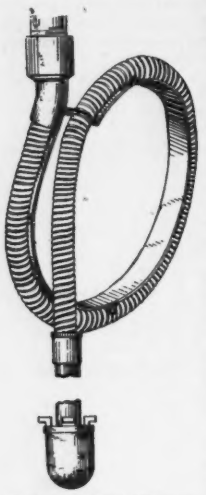
that is passed through the burner-tube A "by creating improved ventilation between the roller and the burner-tube." In order to equalize the heat from the jets of flame from the burner A, the size of the perforations in the burner-tube is decreased, or the distance between them is increased—the perforations being larger and more numerous near the inlet end of the burner-tube.

Anti-Vibrators for Gas-Burners.

HANWELL, H. W., of Northampton.

No. 5384; March 3, 1910.

This anti-vibrator for gas-burners is of the type already known. But in such devices it has before this been proposed to employ a spiral or loop of flexible tube (constituting part of the gas-conduit) disposed in an approximately vertical plane, having one end pendent from the supply conduit and the other end connected to the burner; the resiliency of the flexible tube being depended upon to give the anti-vibratory effect. With such an arrangement, however, the weight of the burner puts a lateral strain upon the tube that is likely to result in fracture and leakage. According to the present invention, however, such a loop or spiral is reinforced by a resilient support in such manner that the weight of the burner puts no side-strain upon the conduit. This is preferably effected by providing a strip of resilient material wound (as shown) into a supporting coil whose axis is approximately horizontal, and having one end secured to the support or supply pipe and receiving the weight of the lamp or burner at the other end; the flexible conduit or wire being held in position by ears or lugs formed integrally with the supporting coil.



Hanwell's Anti-Vibrator for Pendant Lights.

The coil may be variously constructed. For example, instead of the band shown, a spiral of wire may be used, the whole of which is curved to form the coil. In this case, the flexible conduit may be threaded through the spiral if desired. The band may also take the form of a trough, in which the conduit can lie.

APPLICATIONS FOR LETTERS PATENT.

22,227.—COX, G. J., "Recording and computing the value of meter-index movements." Sept. 26.

22,268.—HAMMOND, W. P., "Pressure-gauges." Sept. 26.

22,282.—KRAUSE, P., "Production of air-gas." Sept. 26.

22,303 —LEGGE, A. DI, "Indicating the escape of gases." Sept. 26.

22,310.—ARTHUS, J. A., WRIGHT, W. L. F., and CALDWELL, J. D., "Pipes and connections for gas and other purposes." Sept. 26.

22,317.—HALLE, M. A., "Appliances for kindling." A communication from A. B. Fröhlich. Sept. 26.

22,335.—BURKHEISER, K., "Separating sulphuretted hydrogen from gases." Sept. 27.

22,379.—FAIRBROTHER, H., "Heating burners." A communication from J. B. Colt Company. Sept. 27.

22,384.—MICHL, R., "Burner headpiece." Sept. 27.

22,397.—RORKE, T. J. & E., "Controlling valves by electro-magnetic means." Sept. 27.

22,413.—GREATOREX, W. H., "Cocks." Sept. 27.

22,420.—SCHNEIDER, A., "Burners." Sept. 27.

22,433.—THEISEN, H. E., "Purifying, cooling, and mixing gases." Sept. 27.

22,459.—WRIGLEY, H., "Continuous conveyors." Sept. 28.

22 469.—LLOYD, E. F., "Gas-scrubbers." Sept. 28.

22,515.—PRICTOR, H. T., and WILKINS, E. E., "Sealed union for gas-pipes." Sept. 28.

22,524.—NOBLETT, A., and KITSON, A., "Incandescent vapour lamps." Sept. 28.

22,533.—PROSSER, H. R., "Bye-pass." Sept. 29.

22,546.—HOPKINS, J. H., and STANSFIELD, A. M., "Manufacture and treatment of gas." Sept. 29.

22,551.—HUNT, S, "Non-crushing coke-filler." Sept. 29.

22,563-4.—CROSSLEY, K. I., and RIGBY, T., "Internal-combustion engines." Sept. 29.

22,586.—BUEB, J., and DEUTSCHE CONTINENTAL GAS-GES., "Manufacture of ammonium carbonate." Sept. 29.

22,598.—BENKISER and Co. G. M. B. H., "Taps or cocks." Sept. 29.

22,610.—ARON, E., "Acetylene generators." Sept. 29.

22,646.—YARROW AND CO. (BOLTON), LTD., and YARROW, M., "Joints of pipes." Sept. 30.

22,663.—KILBURN, J., FAIRLEY, J. W., KIDNER, T. B., IRVINE, W. H., and CHESTNUT, W. T., "Gas-generating apparatus." Sept. 30.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Testing of Gas-Fires.

SIR,—After a long series of experiments undertaken to ascertain and improve the thermal efficiencies of gas-fires, more especially in relation to their radiating efficiency, I have been struck by the regularity of the "factor for radiometer value" (see "Report of the Gas Heating Research Committee," June, 1909, p. 16). This number, which I find in over fifty tests of one fire under varying conditions of gas pressure, consumption, and "fuel," averages 24·5—the highest being 25·6, and the lowest 23·7—has led me to investigate the subject, and to form the opinion that the use of the thermopile and galvanometer as at present operated leads to considerable error, especially in the testing of very wide gas-fires.

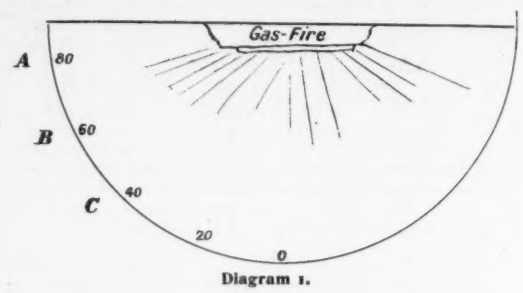


Diagram 1.

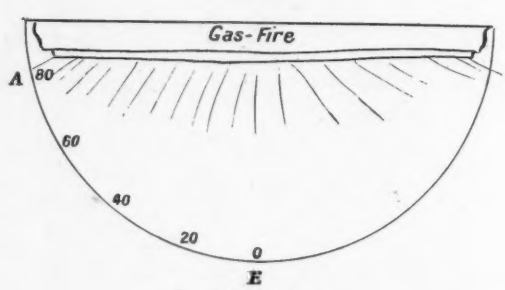


Diagram 2.

For instance, the readings on the galvanometer when the thermopile is at A, B, or C (Diagram 1), seem to be those that affect the "factor for R 7" most; and this appears to be due to the thermopile being closer to the fire at these points, and so giving a higher reading than it would do if the distance between the fire and thermopile was the same all round the semicircle—viz., 34·4 inches.

Now, referring to Diagram 2. Suppose we take a fire having (say) a 20-inch fire-front. By the apparatus in use at the Leeds University, and which is duplicated by nearly all gas-stove manufacturers, the distance from the centre of the fire to the thermopile when taking the centre reading is 34·4 inches or thereabouts. But (and herein is the main point of my contention) this distance is kept only when the thermopile is in front of the fire, in the position E. It gradually becomes less as the thermopile is moved to the side. Naturally, the radiant energy at the sides falling on the face of the thermopile is considerably more intense than it would be if the latter were kept at its first distance of 34·4 inches—thereby giving a high reading on the galvanometer.

To take an extreme case, we will suppose a fire wide enough to fill in nearly the whole of the diameter of the semicircle and the thermopile to be 1 inch from the side of the fire at A. In this position, it would be about 34 times nearer the source of energy than it would be when at E; and it is quite reasonable to suppose that the galvanometer reading when the thermopile is at A would exceed the reading taken when at E by a considerable amount. But the total—including these high side-readings—would still be governed by the reading of the galvanometer when the thermopile is at E.

EXPERIMENTER.

Oct. 7, 1910.

Automatically Lighting and Extinguishing Public Lamps.

SIR,—It is nearly six years since the above was reintroduced to the gas engineering profession—viz., at Earl's Court Exhibition, where different designs of apparatus were on view. Since then, the system has made considerable strides on the Continent—more particularly in Germany; but with our usual conservatism, we have moved slowly in the matter.

From the references made to the subject in your last issue, it would appear that the system is now likely to make better headway, and (to quote Herr Dobert, of Geestemünde) will enable gas to "compete more effectively with electricity for public lighting."

The results of the trials made at Newcastle, according to Mr. John Lewis's report, appear to prove that the experimental stage has been passed; but, on the other hand, the author of the article "Automatically Lighting Street-Lamps" has raised several objections to the various systems in use.

Being interested in a certain design of "controller," the use of which will, I think, overcome some of the difficulties mentioned by the author, I venture to endeavour to reply to certain of his objections—the article being too long to reply to *seriatim* without unduly encroaching on your space.

Referring to "pressure lamplighters," the author states that, owing

to the force required to turn the gas-plug, such apparatus is "useless with low pressures." The controller I am interested in (which for purposes of reference I will call the "Eureka," and not by its trade term) has no plug-cock; the supplies to the burner and bye-pass being controlled by mercury valves.

In regard to "mercury seals," it would appear from trials made at Newcastle and elsewhere that the author is somewhat too pessimistic as to their reliability and as to the mercury splashing on the lead weights and increasing their weight. The "Eureka" has the weights outside the bell; and it is practically impossible for the mercury to come into contact with them.

As to "gas atmosphere" affecting the mechanism, in the "Eureka," what little mechanism there is, is not in contact with the gas.

Referring to the "ordinary pressure lighter" requiring a reduction of pressure and an increase of same for extinguishing purposes, the "Eureka" is made in two patterns—one to light with increase of pressure and extinguish at low, and the other to light at increase of pressure and to extinguish at a second increase, but not so high as that required for lighting.

With reference to the objection raised as to the pilot lights being inefficient, I would say that the "Eureka" operates somewhat slowly when commencing to act—giving a slower cut-off than would appear to be the case with the controllers referred to by your correspondent.

If your correspondent has no objection, I should much like to get into communication with him. I enclose my card.

EUREKA.

Oct. 6, 1910.

SIR,—Referring to the article on "Automatic Gas Lamplighting," which appeared in the last issue of the "JOURNAL," the writer stated in dealing with the question of pressure controllers that almost all of those on the market were limited in their action, and could only meet one set of gas pressure conditions.

It may, however, be pointed out that the "Automaton" is not limited in its action, and is no doubt one of the exceptions your contributor had in view. It has no liquid seals of any description. The mechanism does not work in a gas atmosphere. It is not affected by the accidental variations of pressure caused by consumption and the cessation of consumption. Its motive power is separate and distinct from the gas pressure; the latter being used only to start it into operation. The pilot-flame is extinguished after the burner-flame is lit, and lit before the burner-flame is extinguished; ample time being allowed for the one to light the other. The "Automaton" is not affected by vibration. Its minimum range is 4-10ths of an inch water pressure; and this may be indefinitely increased. It can be adjusted to light and extinguish at the same pressure—engaging at 4-10ths or 4 inches as may be desired below that pressure; or it may be lit at one pressure and extinguished at another, either higher or lower. It may also be so adjusted that a high mid-day pressure—as high as, or higher than, the evening pressure—will not affect the apparatus. The lamps may be lit and extinguished on a fall of pressure; or they may be lit on a fall and extinguished on a rise of pressure. The lamps of one district may be lit later and extinguished earlier than the lamps of an adjoining district in the same gas-works area. The pressure may be put up an hour before lighting time without affecting the apparatus; and the lamps may be lit after the consumption has started, even if the consumption makes the difference of an inch or two inches in the pressure.

At some future time, if thought of sufficient interest to readers, fuller information could be given of how these changes are effected, with pressure charts illustrating same.

AUTO LIGHTER, LIMITED.

Victoria Street, S.W., Oct. 8, 1910.

SIR,—The interesting, critical, and unbiassed article under the above heading, appearing in your issue of the 4th inst., would have been of greater utility had the writer supplemented his very correct criticisms of the different forms of existing apparatus with suggestions of the lines to be followed (as well as those to be avoided) in any attempt to attain a satisfactory solution of the problem.

A concise tabulation of virtues and vices should be of inestimable value to the harassed engineer, who, although anxious to secure the economies resulting from automatic lighting, is threatened with mental paralysis in his honest endeavour to discriminate between the relative merits and demerits of the horde of different appliances with which he is being daily bombarded. Such a tabulation might also assist the experimenter and manufacturer in perfecting pressure-control apparatus.

The following suggestions might serve as a basis which the experience of other correspondents will, no doubt, amplify and revise: 1. Pressure control should be limited to those districts that previous local charting has proved to be satisfactorily conditioned. 2. Lamps in pressure-controlled districts subject to vagarity of pressure due to irregular draft, should be clock-controlled. 3. Where naphthalene troubles are frequent and serious, it is useless to attempt pressure control. 4. In order to work with the minimum rise over the maximum normal pressure, all pressure-control apparatus should be operated by the full pressure and not by the surplus pressure. 5. Where a recurrence of the operating pressure cannot be avoided, the operating apparatus should be provided with both inlet and outlet control. 6. All mechanism, excepting the supply valve, should be accessible, and should not be situated in the gas-chamber. 7. The use of mercury, or other sealing fluids, should be avoided, if possible. 8. Weights should be employed for adjustment; and they should correctly represent the variation they are intended to effect. 9. No diaphragm apparatus should be placed within the lantern. 10. If the diaphragms are of leather, the smooth surface of the leather should be in contact with the gas. This considerably reduces the evil of drying. 11. All metallic surfaces in contact with leather should be enamelled or varnished. 12. Oiled silk seems to be preferable to leather; but a longer experience of its lasting qualities appears to be required.

The following points express views which are not in entire agreement with those of the writer of the article referred to: 13. The pilot flame should be permanent, because its occasional failure is so serious a matter in pressure control that the saving effected by an alternate pilot flame is more than counterbalanced by the loss and inconvenience that failures involve. Further, an alternate pilot burner, when extinguished, allows dust to deposit, which is difficult to remove, and which would be consumed or driven off by a permanent flame. 14. The time of lighting should be accommodated to atmospheric conditions, and should be effected earlier on foggy or cloudy days. This will, of course, reduce the saving effected generally at lighting time; but there is no such loss at extinguishing time. Although the estimate of savings is adversely affected, it should be remembered that all days are not prematurely dark.

The general adoption of automatic lighting can scarcely be expected until some competent and independent body is created which can, as an advising authority, relieve the engineer from his present perplexity in attempting a selection of the method and the means to be employed.

INTERESTED.

Oct. 8, 1910.

SIR,—In your issue of Oct. 4, your contributor, under the above heading, takes a very pessimistic view of the attempts which, during the last few years, have been made to deal with the automatic lighting and extinguishing of street-lamps; and, incidentally, he arrives at some very strange and incongruous conclusions.

The engineers who, according to your contributor, have "turned in despair from pressure lighters to clock controllers," which "have not been entirely successful," are indeed (if such be the case) entitled to commiseration and sympathy; but I think we may safely trust these gentlemen to know what is most suitable for their own requirements, and allow them to act as they think best.

There is no doubt that the pressure or "group" system possesses many advantages which are not to be found in the clockwork or "unit" system. The possibility of taking advantage of exceptionally brilliant or late sunsets to defer the lighting, and of lighting earlier in the case of sudden fog or early darkness, and the fact that the lighting and extinguishing can be done independently of the time-keeping of men or clocks, gives the gas engineer the feeling of security that comes of the knowledge that he is not depending on some outside and uncontrollable agency, but that the public lighting of his town is an integral part of the gas undertaking he is in charge of.

While admitting the truth of many of your contributor's criticisms of pressure apparatus in general, some of his conclusions are not, even from a logical point of view, entirely sound. For instance, he states that those types of pressure apparatus which utilize the whole of the gas pressure to develop the necessary motive power to turn the cock or valve, "are useless with low pressure." What then can be said with respect to the pressure apparatus which only employs a portion of the gas pressure for the above purpose?

Apart from the objections which affect solely the principles employed in the various types of pressure controllers, the criticisms deal mainly with details of mechanical construction, and are therefore not vital in their bearing upon the question at issue.

The trouble of the intermittent pilot-flame not lighting when the gas is turned off from the burner, is easily overcome by the proper timing of same—*i.e.*, it must, in comparison with the burner, be made to light early and extinguish late. This, of course, entirely depends upon the mechanical construction used; or it can be arranged to be augmented by a flash arrangement taking place at both lighting and extinguishing times. This not only allows the pilot-flame itself to be kept clear of the mantle—thus running no danger of blackening same—but ensures, by the sudden rush of gas through the pilot-tube at the time of extinction, the thorough expulsion of the accumulation of the products of combustion in the pilot-tube, which takes place during the lighting hours.

With reference to the danger of the mercury seals blowing through an excess of pressure being given, there is absolutely no fear of this happening with any reasonable increase of pressure, providing the apparatus is constructed in a correct manner.

Assuming the annular space which contains the mercury to be (say) 3 inches in depth, the travel of the bell to be restricted to $\frac{1}{2}$-inch rise, and the bell itself to accurately divide the annular space, then $1\frac{3}{4}$ inches of mercury seal is capable of withstanding approximately 20 inches of pressure without either allowing the gas to force its way through from the inside, or being raised to a dangerous level outside the bell. The danger of the "oily exudations of the gas" breaking up the mercury into minute globules (thus destroying its sealing power), and the risk of the mercury dissolving the leaden weights (thus destroying the adjustment of the apparatus), are non-existent with at least two types of pressure apparatus, because the mercury-sealed bell being merely used as an "operator," the gas is only admitted to its interior twice daily; and as in this case no leaden weights are used on the bell at all, they cannot be dissolved. The writer, who has had years of experience with the latter class of apparatus, does not remember a single instance of the mercury seal failing to perform its proper function.

While it is quite true that leather diaphragms in gas-meters keep soft much longer than those used in automatic lighting apparatus, the reason is not that the larger diaphragm acts as a sponge, but that in the case of gas-meters it is not in contact with the air. In automatic lighting apparatus, the diaphragm is either alternately exposed to gas and to air, or one side is constantly in contact with gas and the other side with the atmosphere. Oxidation therefore takes place more rapidly. The remedy is to not only soak the leather in oil which is not materially affected by constant contact with the atmosphere, but to coat it with some compound which, while not detrimentally affecting the oil or leather in any way, is not itself affected by exposure to the atmospheres. This can be done, and is being done to-day.

The placing of the mechanism for opening and closing the valve inside the apparatus is decidedly bad policy, as all working parts and works likely to be affected through wear and tear should be easy of access—especially as, in case of apparatus getting out of order, it is often an advantage to correct same *in situ*. Here, again, it is only a question of mechanical construction, as there is an apparatus on the market where all the working parts are easy of access and outside the main gas supply. The question of corrosion, due to the gas atmosphere, is easily overcome by making the necessary provisions against it. Innumerable instances can be cited where delicate movements entirely

enclosed in gas have been found to be perfectly free from corrosion after three or four years' running.

In dealing with the class of pressure lighter which relies upon a pressure being reached at lighting and extinguishing times far in excess of what takes place during the day, your contributor is substantially correct in stating that it is impossible for some gas-works—owing to restricted holder capacity or inadequate mains—to give the necessary 1½ inches excess pressure for successful working. This objection, of course, only applies to apparatus which depends upon the margin over and above maximum day pressure for the motive power required. With this type of lighter, the maximum day pressure becomes the minimum night pressure, below which the pressure must not drop, or the apparatus engages ready for the next operation, when a rise in pressure on the district (due in many cases to decreasing consumption) will raise the bells and extinguish the lights. In other words, the permissible fluctuations of pressure after lighting time are governed by the margin existing between the maximum day pressure and the lighting pressure; but to state, as your contributor does, that "this range cannot be mechanically altered" shows lack of knowledge of what has been, and is being, done in this branch of the gas industry.

There are, to the writer's knowledge, four different methods of achieving the above result; but, without attempting to describe them all, perhaps he may be pardoned if he explains the one with which he is most intimately acquainted—*i.e.*, the apparatus invented by Mr. A. E. Broadberry.

This apparatus achieves the result which your contributor implies could not be attained, because it renders inoperative any increase of pressure which is given comparatively slowly; and at the same time it only responds to a sudden increase of whatever strength is arranged for. The pressure after lighting may thus fall and rise, according to increasing or decreasing consumption, without any fear of the lamps being extinguished, because variations due to the above cause always take place (comparatively speaking) slowly; while a sudden increase can practically always be given from the governor-house.

Even where the holder capacity is restricted, and no sharp excess increase can be given, by a special arrangement in the apparatus it can be made to work by lowering the pressure a few tenths for (say) two or three minutes, and then raising it quickly to the same level as before.

The point raised *re* cooking pressures is usually met, when it is given every day, by the provision of an extra blank, so that the apparatus simply works but no lighting is produced.

The seriousness of this objection is only fully realized when the increase of pressure at luncheon time is merely given one day in the week—say, Sunday—as is done in very many districts; but with the apparatus named all that is required to be done is for the engineer to give instructions for the necessary increase to be given at a rate not quicker than 2 inches rise in twenty minutes. This is being done Sunday after Sunday in numerous districts, with entirely satisfactory results to all concerned.

With reference to the saving effected by automatic lighting, it is not necessary to add anything other than to say that the mere fact that all over this and other countries gas engineers and lighting authorities are displacing hand lighting in favour of the new method, is proof that the financial return on capital invested justifies the change.

Although our friend has laid his finger on many of the weak points of automatic lighting, his criticisms only apply forcibly to the past efforts of automatic lighting apparatus manufacturers, and not to those who, realizing years ago these weaknesses, have persevered—improving here and improving there—in order to give the gas engineer the same facility of simultaneously lighting and extinguishing the whole of his street-lamps that has previously been the monopoly of his electrical competitor.

Farringdon Avenue, E.C., Oct. 8, 1910. ARTHUR H. FRANCKS.

LEGAL INTELLIGENCE.

METROPOLITAN WATER BOARD AND THEIR CONSUMERS.

Cutting Off a Supply—Overcharge for Water on a Revaluation.

At the Old Street Police Court last Wednesday, before Mr. Cluer, the Metropolitan Water Board answered adjourned summonses taken out by a Mr. Bibby, who alleged that the Board had unlawfully cut off the water supply of the premises, Nos. 44 and 46, Wilmer Gardens, Hoxton, for non-payment of the water-rate, contrary to the Water Companies (Regulation of Powers) Act, 1887, sec. 4, and the Metropolitan Water Board (Charges) Act, 1907, sec. 26.

Mr. GIVEEN (instructed by Mr. George Kebbell) appeared for the complainant; Mr. COURTHOPE-MUNROE represented the Water Board, whose ASSISTANT-SOLICITOR (Mr. Desmond Collins) was in attendance.

Mr. GIVEEN, in opening the case, said that under the old legislation the purveyors of water had power to cut it off on failure to obtain the rate due in respect of the premises supplied. The Act of 1887, however, made the owner and not the occupier liable when the rateable value of the premises was below £20, or where the occupier or occupiers held by weekly tenancies. By the Act of 1907, it was specially provided that where a house or building, or a portion thereof, was let for a quarter of a year or less, the Water Board could, by passing a resolution at a meeting, make the owner liable for the rate. This, he admitted, had been done in the present case. Mr. Bibby was the freeholder of the two sets of premises named in the summonses; but as to No. 46, he had let it to a tenant named Le Grand; while No. 44 was in the hands of a caretaker, who occupied a portion of the premises as part of his remuneration. Le Grand got into arrears with his rent, and Mr. Bibby, though having a right of entry for non-payment, allowed Le Grand to continue in occupation. When the water-rate for the quarter ending June was not paid, a collector named Hare sent to Mr. Bibby a demand note for it, and also for the quarter ending September in advance. Some correspondence (read by Counsel) followed; Mr. Hare being made acquainted with the fact that Le Grand was tenant under a lease, and that Mr. Bibby had not been able to get his rent. The contention on the other side was that Mr. Bibby had resumed possession, and was therefore liable. This, however, was denied; and it was not until the 1st of August that Mr. Bibby took possession. He had no beneficial possessions at the time the rates claimed were running; and though this was pointed out in the correspondence, the Board, without further notice, cut off the water supply to both premises on the 19th of August. More correspondence followed; the Board holding to their contention as to Mr. Bibby's liability, and demanding £2 8s. as expenses for reconnection. The present proceedings resulted. As to the law upon the matter, Counsel said he had to contend that the Board were in the wrong in cutting off the supply, as, under the Act of 1887, which was known as Forrest Fulton's Act, as it was passed at the instance of the present Recorder of London, the Board had the special privilege of making the unpaid rate a charge upon the premises supplied. Further, he cited the case of *Kellerman v. East London Water-Works Company** to show that the liability for the outstanding rates passed to the purchaser of any house or premises.

Mr. BIBBY was called, and said he was the freeholder of the premises in question. He let No. 46 to a Mr. Le Grand in November, 1907, on a term for seven years. At that time a Mrs. Gray was in possession of No. 46 as a weekly tenant; and she continued to reside on the premises as tenant for Le Grand; while a man named Fisher was caretaker of No. 44.

Mr. CLUER: Your contention is that the Board's remedy was against the people in possession?

Mr. GIVEEN: Exactly.

In answer to further questions, witness said Mrs. Gray left the place about six weeks ago, and Fisher about two weeks later; Le Grand being in possession up to that time. The complainant added that, owing to the water being cut off, he could not let the premises.

In cross-examination by Mr. COLLINS, witness said that Mrs. Gray paid her rent to Le Grand, and Fisher paid no rent.

Mr. CLUER said that, in his opinion, Fisher was not a tenant, but a servant; and as there was no occupier, this would make the owner liable.

Mr. Collins having submitted at the former hearing that he had no case to answer in the absence of proof of Le Grand's lease and the sub-tenancy of Mrs. Gray, this evidence was now supplied.

Mrs. *Gray* deposed that, having been tenant before Mr. Le Grand entered into possession, she continued, and paid him 13s. 6d. weekly for her holding of No. 46, Wilmer Gardens. She produced her rent-book, and said the landlord paid the rates and taxes.

Mr. *Le Grand*, who described himself as of St. George's Square, Pimlico, glass bottle stopper manufacturer, said he took a lease of the premises in question in 1907. Mrs. Gray was his tenant at No. 46, and a man named Fisher, who was employed as foreman, was in possession at No. 44, but paid no rent—it being included in his wages. Witness carried on business in the name of Messrs. Bibby and Co., as this was the trade name already up. He was not any relation to the complainant. He received Mrs. Gray's rent till about a month before he gave up possession. He had to pay rates and taxes for all, as the cottages in question were part of the factory premises.

Mr. COURTHOPE-MUNROE, for the defendants, said the question was whether there was liability to supply empty houses. There was no such provision in the Water-Works Clauses Act of 1847, but only a liability to supply where pipes were laid on and the rates paid.

Mr. CLUER: Do you suggest that if, having paid my water-rate to (say) the 1st of July, and I then go away for my six weeks' holiday, seven days later you may cut off my supply on the ground that the house is empty?

Mr. MUNROE: Yes; but if the furniture is there it would be an unreasonable act.

Mr. CLUER: In respect of a house for which the owner is liable, you may not cut it off at all.

Mr. MUNROE argued at some length that at the time the water was cut off the premises were empty. Le Grand had gone, Bibby refused to pay, and the Board could not get the rate from anybody.

Mr. CLUER said he thought Bibby was not liable until Aug. 14, when he took fresh possession.

Mr. MUNROE: My contention is that we are not bound to go on supplying water from the time the premises are empty till they are let again. We are summoned for cutting off the supply.

Mr. CLUER: "Unlawfully." Yes; and it is unlawful, because you had a right of action against Bibby. At the public expense, you take up the road and cut the pipes. If you had done it before the caretaker went out, Mr. Bibby would have had a difficulty.

Mr. MUNROE: At what date would you say Bibby became liable?

Mr. CLUER: For the whole rate from the 9th or 10th of August. You demanded the rate from Le Grand in July. Fulton's Act says the rate may be recovered from the owner for the time being—that is Le Grand. When we come to the 14th of August, Bibby was the owner, and liable for the whole rate. Instead of going to him and demanding it, someone suggests cutting off the water. That was a wholly illegal act; and the only possible defence is that the rent of the premises included the water-rate. The cutting off entitles the complainant to damages, as he had been unable to relet the premises. Continuing, his Worship remarked that rent, as was well known, was not always all profit; and, after consideration, he had come to the conclusion that to order the Board to pay a sum of 1s. 9d. per day for the six weeks during which the water had been off—about £3 12s. in all—would be a fair award. He also ordered them to pay 15 guineas costs.

Mr. MUNROE asked for a case to be stated on the law; and his Worship agreed to this.

Mr. GIVEEN said the Board ought to reconnect the supply at once; and he asked for a promise that it would be done without expense to the complainant.

Mr. MUNROE: If we have done anything illegal, we shall not charge.

At the Lambeth Police Court, before Mr. Hopkins, the Metropolitan Water Board were summoned last Wednesday to answer the complaint of Frederick Richard that they had wrongly charged him for water-rate

* See "JOURNAL," Vol. LIX., p. 918.

in respect of the quarter from July 1 to Sept. 30 last; and he claimed the return of £1 15s. paid by him under protest.

Mr. RICHARD, who conducted his own case, said he was the licensee of the Britannia public-house, High Street, Peckham. Up to March last, the valuation of the premises was £425 gross and £355 rateable; but it was reduced under the quinquennial valuation to £300 gross and £250 rateable. Up to March last, the amount of the water-rate was £8 17s. 6d. for every six months, payable in advance. A demand was made for £8 17s. 6d. up to next Christmas; and he refused to pay it. On the 16th of September he paid the amount, on the Board's men coming to cut off the supply. A provisional list came into operation on July 1; and he contended that for the quarter ended Sept. 30 the Board had overcharged him to the extent of £1 15s.

Mr. A. B. SHAW, who appeared for the Board, argued that, under their Charges Act (section 13, sub-section 1), they were entitled to make the rate upon the figures standing in the rate-book on July 1. He submitted that the valuation list which was in force on that day and for 27 days afterwards was the old one. On the 28th came the alteration made by the provisional list. His submission was that section 13 fixed for the whole of the quarter the rateable value on which the water-rate was to be assessed, and that it did not alter until the next quarter by reason of the alteration made by the provisional list.

His WORSHIP said the learned Counsel's proposition struck him as being a bold one, as it led to this—that no payer of water-rate could ever get his first quarter's reduction. He decided to make an order for the return to the complainant of £1 15s., with 3s. costs.

At the same Court last Friday, before Mr. Baggallay, the Board summoned Mr. John Lockhart for the recovery of £1 4s. 3d. for water supplied to him at Nos. 141 and 143, Lordship Lane, East Dulwich, for the quarter ended Sept. 30. Mr. W. E. White, one of the Board's collectors, stated that the defendant had paid 16s. 6d., and the Board were prepared to withdraw their claim for the balance of 7s. 9d.; but they asked for the costs of the summons—3s. The defendant objected to pay the costs, and said he considered he had been wrongly summoned. Mr. White said the defendant entered into occupation of the premises on July 1, and the Board's claim was in respect of one quarter's water-rate to Sept. 30, on a rateable value of £55 in respect of No. 141, and of £42 in respect of No. 143. On these values the rate came to £1 4s. 3d.; but they had since been reduced. In answer to the Magistrate, Mr. White said the Board withdrew the 7s. 9d. because of a case decided in the Court on the previous Wednesday, when the Magistrate held that the provisional list was in force from July 1. The Board claimed on the rateable value in force at the beginning of the quarter; their contention being that this was not altered until after that date. The case recently decided was, he believed, to be taken to the Divisional Court. The summons was then withdrawn, without costs.

Unsuccessful Claim for Compensation.

A claim for £300 for compensation from the Oldham Corporation, for the death of one of their gas workmen, was heard in the Oldham County Court a few days ago. It was made by the widow of deceased on behalf of herself and her three children. The man was employed at the Higginshaw Gas-Works, and he met with two accidents—one on the 23rd of June, when he was struck on the head by a large piece of coal; and the other on the 28th when he bumped his head against a wall. Cerebral hæmorrhage resulted, and this caused the man's death. As he was only 31 years of age, it was submitted, on behalf of the claimant, that cerebral hæmorrhage did not usually occur at this time of life unless as the consequence of an accident. The medical evidence, however, showed that there were no external signs of injury, but that there was sufficient indication of disease of the brain to justify the conclusion that death had resulted from natural causes. In giving his decision, the Judge pointed out that it was for the applicant to prove injury done in the course of her husband's employment. There were no witnesses of the second accident, upon which stress had been laid; so that it was necessary to draw inferences from the facts, and consider the medical evidence. As this was to the effect that there was long-standing disease, he was satisfied the man's death was due to natural causes. He accordingly gave judgment for the respondents.

Illegal Tapping of a Corporation Water-Main.

A motor-waggon driver named Harris, in the employ of the Palatine Haulage Company, Guide Bridge, was, at the Stockport County Sessions, before Lord Newton (presiding) and other Magistrates, summoned for taking water from a hydrant of the Stockport Corporation main at High Lane. Mr. Hall, the Deputy Town Clerk of Stockport, stated that the Corporation had made arrangements whereby drivers of motor-waggons could obtain water at various pointson the road; but though the defendant knew this, he took it from a hydrant. It was a serious matter for an unauthorized person to take water from the main in this manner, because the pressure was very high; and this case had been brought as a warning. One of the witnesses for the Corporation said that if defendant had obtained the water from the Rising Sun Hotel he would have had to pay 1s. 3d.; but he took it from a hydrant about 300 yards away. The Bench imposed a fine of 10s. and costs.

Bolton Corporation Gas Statistics.—Mr. Percy Farnworth, the Borough Treasurer of Bolton, has just issued his annual abstract of accounts, together with a prefatory note by Mr. S. Horrocks, the professional Auditor, who says: "The accounts of the various trading departments have been carefully examined, and are, in my opinion, charged with an adequate amount for depreciation and renewals." The net result on the working of the gas department was a disposable balance of £24,243, of which £4243 is set apart for depreciation and £20,000 handed over in relief of the rates. The reserve balance now stands at £56,194. This year £7344 was allocated to reserve, compared with £11,294 last year.

MISCELLANEOUS NEWS.

HARROW AND STANMORE GAS COMPANY.

Developments at the Gas-Works.

During the past week some important developments have taken place at the works of the Harrow and Stanmore Gas Company. Early in August, a gasholder of about 1¼ million cubic feet capacity was completed by Messrs. S. Cutler and Sons, and the workmanship has given great satisfaction to the Company's Engineer (Mr. J. L. Chapman, Assoc.M.Inst.C.E.). A feature of the structure is a staircase leading to the top of the guide-framing; and, so far as we are aware, this is the first holder in the country to be furnished with such means of reaching the upper portions. The holder was brought into use for the first time last week. Another noteworthy improvement has been effected in connection with the manufacturing branch of the Company's operations. Hitherto the whole of the raw material and products, amounting to something like 18,000 tons annually, has had to be carted to and from the railway station, which is about 1¼ miles from the gas-works. This heavy traffic has now been removed from the public roads by the construction of a siding in connection with the Metropolitan Railway; and this also was opened last week. Great economy is expected to result from these changes; and the one just mentioned will doubtless be appreciated by the Local Authority as well as by the residents in the district.

STAFFORD GAS AND ELECTRICITY DEPARTMENTS.

Mr. Pooley's Resignation—Suggested Separation of the Departments.

The presentation of the report of the Gas and Electricity Committee of the Stafford Corporation at the meeting of the Town Council last Tuesday afforded Alderman Wright, the Chairman of the Committee, an opportunity of paying a tribute to the work of Mr. Hubert Pooley, the Gas Engineer and Manager, who, as already announced, has been appointed Gas Engineer and Manager to the Leicester Corporation. He said it was with very great regret that the Committee had received news of Mr. Pooley's resignation; but they must congratulate him on his new appointment. He was sure the whole Council had appreciated the faithful, energetic, and capable way in which Mr. Pooley had discharged his duties at Stafford. Since he was appointed, the gas-works had materially increased; and the last report was a record so far as the profits and capacity of the works were concerned. They gave £3500 to the rates—which was equal to a 9d. rate—the highest sum on record. As to Mr. Pooley's successor, the Committee proposed to start him at the salary Mr. Pooley received when he was appointed ten years ago. But seeing how the department had increased, they suggested that whereas the salary was then limited to a maximum of £450 per annum, the new maximum should, after six years, be £500. He moved the adoption of the report.

The motion having been seconded by Alderman Mottram, who, with other members of the Council, supported Alderman Wright's eulogy of the services rendered by Mr. Pooley, Mr. Bedford suggested that this would be an opportune time for the Council to divide the Gas and Electricity Departments, and put them under separate management. Alderman Wright acknowledged that the Committee were divided on this matter, but said a large majority were against the proposal. Some of them thought the Electricity Department would cease to exist if it were brought into active competition with the Gas Department. But they decided that the accounts should be made up at the end of the year under the instructions of the Borough Treasurer, and that the electrician at the electricity works should in future report personally and direct to the Committee, instead of through the Gas Engineer. This practically made him head of the department, leaving only the commercial side to come under the control of the Gas Engineer. The electrician would be independent of the Gas Engineer, so far as the technical part of his work was concerned. The report was adopted.

PUBLIC LIGHTING OF PADDINGTON.

Gas v. Electricity.—Proposed Scheme of Improved Gas Lighting.

At the Meeting of the Paddington Borough Council last Tuesday, a report presented by the Works Committee on the subject of the public lighting of the borough was under consideration. It was originally submitted on the 21st of July; but no action was then taken upon it, owing to the non-suspension of the Standing Orders.

The Committee reported that the Gaslight and Coke Company had written submitting a scheme for improving the street lighting of the borough by using inverted burners instead of the existing upright burners. The matter was considered so important, that a copy of the letter was given in an appendix to the report; and the Committee pointed out that the improvement could be carried out without any additional cost to the borough, either annually or in the way of capital expenditure. The Borough Surveyor had been in communication with Mr. F. W. Goodenough, the Controller of the Sales Department of the Company, and had ascertained that the Company would provide the necessary new bracket-irons to take circular lamps in lieu of the present square ones; bear the cost of the paving works in connection with the removal of the present meters—viz., about £50 or £60; and undertake all responsibility with regard to knocked-down lamps, provided the Council gave the Company all reasonable assistance in recovering costs from the persons causing the damage. The price per lamp was to be a fixed one, and not vary with the price of gas. As to the Council's employees, the Company would take them over subject to good behaviour. They could not guarantee pensions to men over 35 years

of age; but the lighters would receive 23s., 24s., and 25s. per week, against the borough's rates of 22s., 23s., and 24s.—service with the Council counting as with the Company. Further, the men would have the chance of becoming co-partners in the Company. As to street name tablets on the lamps, the Company would provide these to a total of one in five. Generally, the Company were prepared to pay any other cost or charge usually included in the borough's annual statement of expenditure.

The Company said they would be prepared to light the lamps in foggy weather; and if the Council decided to instal lights in the private roads of Westbourne Terrace, they would provide 16 single-burner lamps there instead of 13, as mentioned in their letter, without altering the total cost of their scheme. As an alternative to providing the 16 lamps referred to, the Company's Engineer would consider the possibility of utilizing the high standards in Westbourne Terrace, though he did not hold out much hope of being able to do so. He had undertaken to have the following specimen lamps fixed in the borough, in order to enable the members of the Council to inspect them before the Council meeting: Three-light burner lamps in Edgware Road (between Harrow Road and Oxford and Cambridge Terrace); two-light burner lamps in Harrow Road, from Edgware Road; and one-light burner lamps in Oxford and Cambridge Terrace and Westbourne Terrace.

The Committee recommended the Council to enter into an agreement with the Company for lighting the borough in accordance with the conditions mentioned in their letter and the arrangements made by the Borough Surveyor with the Controller of the Sales Department of the Company.

The following is the letter from the Gas Company to the Town Clerk (Mr. A. W. J. Russell) referred to in the report:—

I have pleasure in submitting the following proposals for improving the street lighting of the borough of Paddington.

The borough is at present lighted by 4014 lamps fitted with upright incandescent gas-burners, 49 of that number containing three burners, 14 containing two burners, and the remaining 3951 containing one burner. The total effective average illuminating power is about 200,000 candles. The light obtained for the gas consumed can be materially increased by the substitution of inverted for upright burners; the former giving from 30 to 50 per cent. greater efficiency than the latter. For the installation of inverted burners, new lamps throughout the borough would be necessary; and circular lamps of the type recently inspected by the Works Committee in other parts of the Company's district are strongly recommended.

For the further improvement of the lighting of the main thoroughfares, in view of the higher standard of street illumination that has been adopted in other districts since the lighting of Paddington was last revised, the substitution of two-burner and three-burner lamps for one-burner lamps is recommended. It is suggested that three-burner lamps should be adopted in Bayswater Road, Edgware Road, and Maida Vale, which carry the heaviest and fastest traffic in the borough, and that two-burner lamps should be installed throughout the Harrow Road. For the improvement of the lighting of the inner carriage drives in Westbourne Terrace, the installation of about 13 single-burner lamps in these drives is recommended, in preference to increasing the number of burners in, or the height of, the lamps in the main road. If these suggestions were adopted, the numbers of lamps would stand as follows: 3534 one-burner lamps, 225 two-burner lamps, and 268 three-burner lamps; and the total illuminating power would be equal to over 380,000 candles, or 90 per cent. increase over the present light.

If granted a contract for the lighting of the whole borough with approximately this number of lamps for a period of ten years, the Company would be prepared to carry out the whole of the installation of new circular all-copper lamps and burners at their own cost; the lamps becoming the property of the Council at the conclusion of the contract, and the old lamps and burners becoming the Company's property as and when replaced by new. Also for the supply of gas for the usual lighting hours; the lighting, extinguishing, cleaning, painting annually two coats, repairing and renewing of lamps and burners; and the maintenance of mantles in good lighting condition, to charge the following inclusive and fixed prices per annum:—

Lamp with one inverted burner consuming 3½ c. ft. per hour . .	£2 12 6
Lamp with two inverted burners consuming 7 c. ft. per hour . .	4 0 0
Lamp with three inverted burners consuming 10½ c. ft. per hour .	5 10 0

At these prices, the total annual cost would be—

3534 lamps, at £2 12s. 6d.	£9,276	15 0
225 ,, at £4	900	0 0
268 ,, at £5 10s.	1,474	0 0
Total	£11,650	15 0

This compares with an average annual cost for the past three years (excluding capital charges) of about £11,650; so that an immense improvement in the lighting would be effected at no increase in annual cost, and without the borough incurring any capital expenditure whatever.

I should add that these terms are only applicable to the whole, and not to a part, of the borough, as the Company could not offer such exceptionally liberal terms except in consideration of their securing the lighting as a whole for a reasonable term of years. If entrusted with the work, the Company would spare no effort to carry out the installation in a thoroughly satisfactory manner, and to maintain the lighting subsequently with credit to themselves and to the entire satisfaction of the Council and ratepayers. If the Committee desire any information on any point arising out of this proposal, the Chief Inspector (Mr. F. W. Goodenough) would arrange to attend before them at any time appointed.

After the preparation of the report, a letter was received from the Gas Company stating that after the expiration of the ten years' contract it was the Company's intention (provided the costs of gas manufacture and street-lamp maintenance did not increase during this period) to reduce their charge by at least £1000 per annum.

The Finance Committee also brought forward a report on the matter which had been previously presented and adjourned. They stated that they had had under consideration the report of the Works Committee, in conjunction with communications from the Gas Company with reference to a scheme for improving the street-lighting of the borough by using inverted instead of the existing upright burners. The effect of the proposal was that the Council should be responsible for an expenditure of £13,000 on capital account—the amount of such expenditure to be provided in the first instance by the Gas Company, and afterwards to be repaid by the Council by annual instalments of £1300 for ten years. This £1300 would form part of the total annual charge, estimated at £11,650, for lighting the borough. As the first-named proposal practically involved the borrowing of money, the Committee said it would be necessary to apply to the London County Council for sanction to the loan before any contract could be entered into. The following other points were submitted for consideration: (1) The contract should provide that the quarterly payments should be made subject to a certificate from the Borough Surveyor that the lighting was satisfactory. (2) That in event of the Gas Company failing, in the opinion of the Borough Surveyor, to carry out the terms of the contract, and subject to an appeal by the Company to the Engineer of the London County Council, the Borough Council should be at liberty to terminate the contract without incurring any liability whatever, either on revenue or capital account. The Committee also pointed out that if the Council should desire to change the system of lighting during the period, the balance of capital expenditure would probably have to be a charge on the rates for the year in which the change took place. They concluded by recommending that application should be made to the London County Council for sanction to a loan of £13,000, for a period of ten years, for carrying out the scheme.

After a short discussion, a resolution was submitted that the report should be referred back to the Works Committee for them to consider the questions of obtaining a shorter period than ten years for the contract, paying off the capital outlay, and taking advantage of any reduction in the price of gas.

The former Chairman of the Works Committee (Alderman Whur) said the Council had had under consideration for years the question of the street lighting of the borough; and, having investigated and inspected the lighting of London, they had come to the conclusion that gas in its latest form was by far the best method. According to the wording of the contract, they were actually able to effect a saving in the rates owing to the powerful resources of the Gas Company. Electric light was nowhere, with regard either to illuminating power or cost, in comparison with gas. Under the proposals of the Gas Company, they were to have double the present lighting power. With respect to statements about the unhealthiness of gas, all he could say was, considering that nearly every person in the Metropolis was a user of gas in some form or other—for heating, lighting, or cooking—there must be a large number of sick people in the London area.

The Chairman of the Works Committee agreed to take the report back to consider the questions raised, though he said his opinion was that the lighting under the proposed contract was the best the Council could have, as, owing to the new developments in gas lighting, the Gas Company were able to supply light with the smallest amount of gas. The Electric Light Company had had an opportunity of making a demonstration in the streets of the borough, and the result justified the report presented by the Committee.

ELECTRICITY SUPPLY FINANCES AT NEWPORT (MON.).

Illegal Overdrafts.

The records of the various Committees of the Newport (Mon.) Corporation, which were issued last Thursday, contain some rather interesting information as to the financial position of the Electricity Department. It is set forth that Messrs. Elvy, Robb, and Welch, Solicitors, who have been consulted by the Newport Ratepayers' Association, have written to the Town Clerk with reference to the financial transactions of the borough. They state that for several years past there have been borrowings by the Council from their bankers upon the electricity revenue account; that interest has been paid in respect of such borrowings; and that it has been established by a number of decisions that borrowings of this kind are entirely illegal. After dealing with the accounts, they say they gather that it is proposed to include the amount in the next rate to be levied; but they declare that such a course would be quite illegal, inasmuch as the expenditure to be covered was incurred more than six months prior to the making of the rate, and, moreover, has not been included in any estimate for the rate. They request the Council to give an undertaking: (1) That the overdrafts of the electricity and revenue account shall not be paid, or, as regards the bank, received out of the revenue or the general district fund, or any other public funds not legally applicable towards the payment of the same. (2) That all sums already paid for interest in respect of overdrafts on the electricity revenue account shall be restored to the revenue account forthwith, or to the other accounts from which the payment was made; and that no further sums shall be paid for interest on such overdrafts. (3) That the Corporation will not make or enforce or receive payment of any rate made for the purpose (*inter alia*) of paying off these bank overdrafts or of paying interest in respect of such overdrafts. (4) That the Corporation will not make, enforce, or receive payment of any rate for the purpose of paying off the sum of £3500 standing to the debit of the electricity capital account.

The Committee, having considered the letter, the Town Clerk has been directed to reply to the following effect: It is true that, by reason of the receipts of the electricity revenue account not being equal to the expenditure, there has been from time to time at the end of the financial year an overdraft representing the deficit on the year's trading, and the requirements, as soon as the actual loss for the year was correctly ascertained, have been paid off out of the general district fund. Upon such overdraft the bankers have charged, and, of course, have been paid, any interest due. The Council, in passing the resolution as to the sum of £3500, were acting expressly in accordance with the requirements of the Local Government Board. It cannot be admitted that the statutory provisions have been entirely ignored, since an account of such deficiencies is kept in the books of the Corporation; and while the Act says that interest shall be payable (not paid) thereon, the Committee leave it to the judgment of the Corporation as to when this should be done. Dealing with the suggested undertaking, the letter concludes that the Corporation recognize the serious change which the recent case of *Attorney-General v. Corporation of West Ham* must make in the mutual relations between them and their bankers, and the question will receive their early consideration. But they are not prepared voluntarily to repudiate their just debts and liabilities to their bankers in respect of the past; nor can they think, knowing the *personnel* of the Newport Ratepayers' Association, that this body would wish them to dishonour themselves and the town by so doing.

CO-PARTNERSHIP AT WATFORD.

Presiding recently over the first general meeting of the Watford Gas Company's co-partnership members (at which there was an attendance of about sixty), Mr. E. J. Slinn, the Chairman of the Company, said he must congratulate the employees on the really substantial amount of their financial interest in the undertaking. It was, indeed, most gratifying to see that no less than forty members had already qualified for £10 of the Company's stock. This meant that in a little over a year £400 of the Company's stock fell to be divided between forty members of the co-partnership fund. In brief, it would be seen from the balance-sheet that, while the employees had contributed £374, the Company had added to this a sum of £446, making a total saving of no less an amount than £820. It was as well to remember that, had the contributions been paid into the Post Office Savings Bank, they would not have amounted to more than £384, as against £820. It was not therefore altogether as a savings bank that they must look at the co-partnership fund. It was not a concession given by the Board. It was not an allowance for extra labour. The employees were being given the opportunity of becoming their own masters. Whatever profit the Company made, the men must share in it, not only by their wage, but by their interest in the Company as shareholders. Everything they did, every real earnest effort put into their work, returned to them twice over. They reaped not only what their manual or clerical labour was worth, but also their share in the divisible profits earned by them, as shareholders of the Company. Most of them were gas consumers; and therefore if the undertaking was prosperous, they were "thrice blessed." They reaped the advantage of a low price gas, of their weekly wage, and of their interest as shareholders. Be true co-partners, and the whole work would go with a will; be drones, and they would be a drag, not only on the Company, but on every co-partner who was now, or soon would become, a shareholder of the Company. There was no half-way; and the Board were very glad to see that, with few exceptions—and these they could believe were only through not having a thorough grasp of the scheme—the co-partners meant to get on.

The adoption of the report was seconded by Mr. E. A. Smith, and carried unanimously. Votes of thanks to Mr. A. Temple Rowe for serving as professional auditor to the fund, and to the Chairman for presiding at the meeting, were carried with enthusiasm.

PUBLIC LIGHTING OF WATFORD.

The Question of Electricity or Incandescent Gas.

At the last Meeting of the Watford Urban District Council, Mr. Tripp moved—"That it be referred to the Finance Committee to prepare a comparative statement showing the present cost of lighting the streets of the town by electric light, and the cost of lighting same by incandescent gas, in accordance with the suggestion of the Local Government Board." He said that the Board had informed the Council that they had sanctioned the last sum required for public electric lighting "with some hesitation," and they added: "The Council should continue to give the question as to the advisability of lighting the streets with electricity their careful consideration, as the Board would have considerable difficulty in sanctioning further loans for the purpose unless the position is materially improved." This, said Mr. Tripp, was a very strong letter from a Government Department; and it was particularly so when the fact was borne in mind that the President was one of the strongest supporters of municipal trading in the country. Before such a letter was sent out, Mr. Burns must have had very strong reasons for believing that the Council's policy in regard to street lighting was not in the best interests of the ratepayers. As he (Mr. Tripp) understood, the Local Government Board made a similar suggestion three years ago; but apparently nothing was done. It must be remembered that the local inquiries into loans were held by Local Government Board Inspectors who were electrical engineers of great experience; and on two occasions these gentlemen had emphatically pointed out that the Council should seriously consider the matter of public lighting. The Committee had, however, ignored the suggestions of the Board. Electricity had made great strides in the last few years; and for private lighting and power purposes it no doubt had a great future. But in regard to public lighting the case was different. The City of London—the first city to light their streets by electricity—had found that it was infinitely more costly than gas, and had gone in for an extensive system of incandescent gas lighting. Precisely the same thing had happened in Westminster; and many other boroughs had followed the examples of these two places. Wherever an investigation had been made as to the comparative cost of gas as against electricity, the figures had come out in favour of gas. Liverpool was said to be the best-lighted city in the country; and there the Corporation, in spite of the fact that they owned an electricity undertaking, lighted the streets by gas. Most of the Watford streets were badly lighted; and he suggested that the Council should go to the Gas Company and say that whatever proposals they were prepared to submit would be carefully considered, and if the Company could give them a better light at a lower cost, the Council, in the interests of the ratepayers, would adopt gas for street lighting. They were asking now for a loan of £7000 for electrical purposes; and this loan, he contended, ought not to be taken up until the Council had the investigation proposed in his motion.

In formally seconding the motion, Mr. Long suggested that if the Council moved in the direction of gas they should endeavour to buy out the Gas Company. The Chairman of the Electricity Committee (Mr. Goodrich) said he had recently been on the Continent with some other members of the Council, and all the best street lighting they had seen had been done with electricity. After denying that the suggestions of the Local Government Board had been ignored, the speaker went on to say that if there was any real anxiety to have the whole question investigated he for one would not put any obstacles in the way. With regard to the last words of the motion, one would think the Local Government Board were anxious that the Council should consider the whole question of public lighting, with a view to superseding electricity by gas. As a matter of fact, the Board had never made any such suggestion. In a letter from them three years ago, they said: "The Board thinks the District Council should carefully compare the cost and advantages of lighting by electricity and gas before proceeding any further with extensions of the system of lighting the streets by electric incandescent lamps." The Council had not proceeded any further with lighting by electric incandescent lamps; their extensions had been with the new metallic filament lamps. The Board's remarks did not apply to the system generally, but only to further extensions. At the time of the inquiry, they had 921 lamps, with a total illuminating power (including that of the arc lamps) of 18,000 candles; and for this the Council were paying £4124. To-day they had 1012 lamps, with an illuminating power of 41,000 candles, and all for the same money they paid three years ago. With reference to the £7000 loan, only £300 of it was for public lighting in the next three years, and £400 was for excess expenditure on public lighting. Whatever else they spent would be taken out of revenue. In regard to the Cities of London and Westminster, neither of these had electricity undertakings, and, of course, they bought in the cheapest market. If Watford were in the same position, they would do likewise. Out of the 29 Metropolitan boroughs, only ten now used gas exclusively for street lighting.

In reply, Mr. Tripp said his whole point was that the Local Government Board Inspector had heard all Mr. Goodrich had told them, and a great deal more. These Inspectors had a most extended experience of electricity undertakings, because they were always going from town to town holding inquiries. The objection of the Board was not altogether that the Electricity Department was not properly conducted; they said that the cost of public lighting was so far excessive that the Council ought seriously to consider the matter before they spent more money, and see whether they ought not to adopt incandescent gas.

In the result, Mr. Tripp's motion was carried by seven votes to five.

IPSWICH WATER SUPPLY.

New Source at Akenham.

In the summer of last year, the Water Engineer of the Ipswich Corporation (Mr. C. W. S. Oldham) reported to the Water Committee that the maximum weekly consumption of water had then risen from 10,646,000 gallons in 1898 to 14,451,000 gallons in 1908, or from 1,521,000 gallons to 2,064,000 gallons per day. This, he pointed out, clearly indicated that the town would in a few years require more water than was available to supply the maximum demand, seeing that the largest quantity that could be obtained from the existing sources was 2,180,000 gallons per day. It was not thought advisable to attempt to increase the supply from the present wells and boreholes, but to go outside the town, and draw water from the chalk. Eventually a site at Akenham was secured, and a trial borehole 24 inches diameter, to yield 500,000 gallons a day, was sunk. The work was started about a month ago; and at a depth of 12 ft. 6 in. the chalk was entered and water soon met with. The work was pushed on; and in twenty working days a depth of 300 feet had been reached.

The bore is lined with steel tubes to the extent of 54 feet, at which depth the chalk was found sufficiently hard to stand. The natural rest-level of the water is 34 feet from the surface. The official test in the contract before the sanction of the Local Government Board can be obtained for the construction of permanent pumping works is generally that 500,000 gallons a day shall be pumped for 14 days. But it soon became evident that there was more water available than would satisfy this requirement; and, as a matter of fact, nearly 750,000 gallons have lately been pumped daily without any serious lowering of the level of the water in the bore. The pump is 15 inches diameter, with a 3-feet stroke, and works at the speed of 25 strokes to the minute; and according to the terms of the contract it has to keep on for 14 days and nights continuously, with no longer stop than an hour at a time, and a total stoppage in the 14 days and nights not exceeding three hours. When pumping 860,000 gallons a day, the water in the bore was only depressed about 15 feet from its natural rest-level. The water as it comes to the surface is received in a large tank constructed of the chalk taken from the borehole, whence it runs into a wood channel, by means of which the flow can be easily measured and checked. The water at present is milky, because the pumping is being done actually in the chalk; but when the lining is continued to the requisite depth, it is expected that the water will be quite clear. The Public Analyst reports that it is fit for drinking and all purposes of a public supply. The work was carried out by Messrs. F. Smith and Son, of Grimsby.

At the meeting of the Town Council last Wednesday, the Water Committee presented a report on the subject of the new supply, and asked for confirmation of their action in regard to it. The Chairman of the Committee (Mr. R. G. Bennett) said they presented their report with the greatest possible pleasure. The satisfactory result recorded had been entirely due to the care and trouble taken by the Water Engineer; and they could congratulate themselves upon having such an officer. They had obtained more water than they expected—at least a million gallons a day—and he should be glad when the supply was connected with the reservoir. He moved the adoption of the report; and the motion was carried unanimously.

Position of the North Oxfordshire Water Company.—The following remarks appeared among the City news in the "Daily Mail" on Monday last week: "While the failure of the Mid-Oxfordshire Gas Company has just been before the public, a debenture-holder in the North Oxfordshire Water Company asks to be put in communication with his fellows. Complaining to the Company of the absence of his interest, he received no reply to his first letter; in reply to his second letter, regret was expressed at the delay in payment; and in reply to his third, it was stated that a Receiver had been appointed. As we have before pointed out, the losses on these small gas and water undertakings are numerous enough to instil extreme caution."

METROPOLITAN WATER BOARD.

The Financial Position.

The Metropolitan Water Board re-assembled last Friday for the first time after the summer recess, under the presidency of Mr. E. B. BARNARD, the Chairman.

The Law and Parliamentary Committee presented a long report on the Water Supplies (Protection) Bill, 1910, which now awaits consideration by the House of Lords. Sir Melvill Beachcroft moved that the consideration of the report be adjourned; remarking that the matter was one of vital importance. The Board had arranged for supplies of water for the next thirty years; but this period was not a long one in the history of the Empire's capital. The Board had to realize their responsibilities; and something should be done to stop the filching of London's underground water supply by sinking private wells. Consideration of the report was eventually adjourned.

A motion was submitted by Mr. D. R. Paterson that it be an instruction to the Appeal and Assessment and Finance Committees of the Board to report as to the propriety of taking steps to ensure that the Board's expenditure in respect of interest and sinking fund and Imperial and local rates should be borne by the ratepayers generally. His argument was that, the supply of water having a distinct sanitary value, and providing a safeguard against fire, the ratepayers should contribute to its cost, whether or not they were consumers. As things were, the water charges were borne by those interested in property to the value of £37,000,000, against a total rateable value of £45,000,000. Mr. Musgrave said the Board had to be regarded as a commercial undertaking. There was a deficiency, already ascertained, in respect of the year 1909; and it was certain that there would be deficiencies for 1910 and 1911. These would, no doubt, have to be met by a precept. But as to the future the position was this—that Parliament had imposed certain restrictions in the matter of charges which made it impossible for the Board to meet their expenditure. The Board had, for instance, in some cases to supply water for 6d. per 1000 gallons, whereas the cost price was 8½d. He thought the time had come to consider as to whether steps should not be taken to secure a revision of the Board's Charges Act. In the course of further discussion, Mr. Fitzroy Doll said he had been placed in the position—humiliating to a member of the Board—of being instructed by clients to include in his plans for the building of two large hotels in London the provision of private wells. This meant a loss of £800 or £900 a year to the Board in each case. Mr. J. Gunton mentioned that he had sunk six wells in the City for clients; and the consequent loss to the Board was very great. Mr. Karslake regarded it as a false proposition that the whole of the cost of the water supply should be cast upon the consumers. The general body of ratepayers should contribute, as in the case of paving, lighting, and sewerage. It was stated by Mr. Tozer that a report upon the whole subject was shortly to be presented by the Finance Committee; and Mr. Paterson's motion was approved.

QUALITY OF HOLYHEAD WATER.

A Pure and Wholesome Supply.

An answer to the much-discussed question of the quality of the Holyhead water supply was given by Mr. J. H. Burton, the Chairman, at the recent half-yearly meeting of the Holyhead Water Company. He said the supply from Lake Traffwll was now in excellent condition, and the quality of the water was continually improving. When they succeeded in getting the Traffwll supply into good order, they found its quality superior to that of the water obtained from the mountain reservoirs. Coming to the controversy between the Council and the Company concerning the purity of the water supply, the Chairman explained that, at the instance of the Council, a sample of water was analyzed, with the result that it was found to be badly contaminated; and a very strong letter was addressed to the Company by the Town Clerk. As a result, the Company ordered a thorough investigation of the system, including all the sources of supply and the filtered products, to be made by Drs. Thresh and Beale. As the result, they found that the water furnished to Holyhead was of good quality and perfectly wholesome. Further samples were taken by the Council, some of which were satisfactory. Reporting on one sample, in which the water was found by the Council's Analyst to be bad, Drs. Thresh and Beale said it was of "good quality, and well adapted for all domestic purposes." On Aug. 20, the Council also took three more samples, and forwarded them to their Analysts. This time they had two good reports, and one that was perhaps less satisfactory. The Directors were much puzzled at this, and the Chairman put before the shareholders the following as a probable and sufficient explanation: The greatest precautions were necessary when taking samples of water, especially for bacteriological examination. However careful one might be, it was actually impossible to ensure that a sample should not be contaminated by germs after it had left the main. It naturally followed, therefore, that when several samples taken from the same main were found to vary, the favourable reports described the true character of the water, and the bad ones were inaccurate. He felt sure that in some such manner as this the present alarm had occurred, and that the Company's water, notwithstanding the Council's suggestion to the contrary, was, and would be, proved to be of excellent quality, and pure and wholesome for all domestic purposes. The Company's Engineers had written a letter, in the course of which they said: "You will no doubt make a statement to the shareholders at the general meeting on the position of affairs, and can then say with confidence that the water the Company are supplying is of excellent quality, as is proved by the reports of Drs. Thresh and Beale." The alarm had been damaging both to the Company's revenue and reputation, for the complete survey of their property that was necessary to convince them that their water was not in fault entailed heavy expenditure, which was not altogether balanced by the fact that the exhaustive report received would be useful to the Board in many ways for some time to come.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. J. Fraser, of the Provan Gas-Works, this evening opened the session of the Western District of the Scottish Junior Gas Association with a very thoughtful address, chiefly upon retort heating. This is a subject in which Mr. Fraser has had a large experience—an experience almost unique. His conclusions, therefore, are worthy of attention. As in the Eastern District a fortnight ago, there was an indication in the tone of to-night's meeting that the members mean business this session. The prosperity and advancement which have been showered upon members of the Junior Association quite sufficiently account for the resolve to make more of membership in the Association than some have hitherto sought to do. The Junior Association is already an undoubted power; and a power for good.

The Smoke Abatement Exhibition in Glasgow was closed to-night, without ceremony. It has been a very great success, from all points of view. As an educative influence, when it is stated that in the course of the three weeks in which the exhibition was open it was visited by over 60,000 people who paid for admission, free-list visitors—and there were a great many—being over and above, it will readily be realized that an appeal has been made to a very wide circle indeed. To the organizers of the exhibition, it has been exceedingly gratifying that the attendance throughout has been of the class to whom it was the intention to appeal—that is, the middle class of the community. The exhibition was not run as an entertainment; consequently it proved no attraction to triflers or frivolous persons. Those who visited it came with inquiring minds, which had the effect of keeping stall attendants busy; and this, in turn, led to orders. The influence upon the public has been great; but that is almost exclusively local. There is another influence, very much wider, which has been exerted through the medium of gas undertakings. The exhibition has been a subject of great interest to gas managers, not in Scotland only, but beyond her borders. Managers and other officials of gas undertakings came from near and far to see the latest which there was to be seen in the exhibition in the application of gas. The most complete of all these bodies who made the exhibition an educational objective was the Corporation of Arbroath, a large representation of whom paid a visit on Wednesday. Coming as a Corporation, they received particular honour. The same has to be said of a deputation from the Corporation of Manchester, for whom entertainment was provided by the Gas Committee of the Glasgow Corporation. There were also what may be termed official visits from Aberdeen, Dundee, Airdrie, Coatbridge, Rothesay, and other places; and, in addition, there were many unofficial visits. All these will have a powerful effect in disseminating the notion, which is at the present moment possessed of the community, that in the matter of lighting and heating coal gas is the housewife's best handmaid. During the run of the exhibition, the commercial side of the business has been very active; but it is the experience in other places that orders come in more freely after the event than during the currency of an exhibition. To a very large extent fires and cookers sent out in connection with an exhibition act as advertisements, and bring in further orders; while it is no uncommon experience that in some households the feeling is to give the vendor of gas appliances the go-by, but that when it is discovered that a neighbour has taken to gas for heating, and is delighted with it, the doubting ones come round, and another stove or heater is asked for. The experience of the Glasgow Gas Department, there is no reason to doubt, will be as it has been elsewhere; and we may rely upon it that before the year is out the demand for gas fires of all sorts will have very largely increased. There can be no doubt, also, that the exhibition will have given a help to undertakings outside Glasgow, and that the current twelvemonth will see, in consequence of the holding of this exhibition, a large increase in the use of gas appliances throughout the country. In this way, and for these prospective benefits, the gas industry are under a debt of obligation to the Corporation of Glasgow and the officials of the Gas Department for the way in which they have organized and managed the exhibition. To Mr. Alexander Wilson the very highest praise is due for his energetic and thoughtful action all through—first in the making of the arrangements for the exhibition, and afterwards in the close touch he kept himself in, in all matters relating to it. There can be no blinking the fact, even by those who may be disposed not to see so much good in gas as in other modes of lighting and heating, that gas has, by means of this exhibition, been given a lead in the minds of the people. No other single exhibit was in itself equal to the lighting or heating effects obtained from a single gas apparatus; and no other mode of lighting and heating which was on view could be made applicable to so many of the services of the home, factory, or street. This is very gratifying; and surely the industry which a generation ago was all but universally regarded as being played out, and has now, by inherent merit, rehabilitated itself in public estimation, will be able to keep its present happy position against all comers.

It perhaps ought to be mentioned that the exhibitors last night held a dinner in the Windsor Hotel, which was presided over by Bailie Paxton, the Sub-Convener of the Gas Committee. The company numbered nearly eighty, and included a large representation of the Gas Committee. There was much happy conviviality, for which the great success of the exhibition was accountable. The Chairman congratulated the exhibitors and all concerned on the remarkable success which had attended the exhibition. From the commercial point of view, he said, it had far exceeded their most sanguine anticipations; the sales of appliances for heating and cooking and other purposes having immensely increased during the past three weeks. More than one attempt had been made by the citizens of Glasgow to remedy the smoke nuisance; but this was the first determined and united effort on their part to educate the public in methods by which a purer atmosphere might be obtained. That these endeavours had not been in vain was clearly shown by the very large attendances of the public, and by the satisfaction felt by the exhibitors with the results. Though the exhibition was closing next day, he believed the

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of the Gas Fire, we set out four seasons ago on a definite campaign to render re-
Fires on reasonable terms. We stated then our intention, we pinned our faith to the
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ducers of the only complete series of Gas Fires of High Efficiency combined with
is only assailed by those jealous of our success.
duced—not one fire only interchangeable with itself—but a complete series of three
changeable fire with fire. Since then we have never retreated, the series has been
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opinion was widely entertained that the education of the citizens in regard to air purification should be carried further by the promotion of a similar exhibition in the near future in another part of the city. It was only by such efforts that they could hope to advance towards the object they had in view.

Besides the Smoke Abatement Exhibition, the people of Scotland have this week had, as a means of drawing their minds gaswards, a small share in the entertainment of the German Gas and Water Engineers. The proceedings in the course of the visit are narrated in other columns, and need not be enlarged upon here. All I need say about it is that, both in Edinburgh and Glasgow, the visitors impressed our people with a sense of the thoroughness with which the Teutonic mind applies itself to business. A cursory glance was not sufficient for them. Details were sought for, and were noted with apparent intelligent satisfaction. The visitors received a hearty reception in Scotland; and I am told that when they left for the South they expressed themselves in no unmeasured terms of appreciation of the attention which had been paid to them.

The Gas Committee of the Falkirk Town Council, who a fortnight ago recommended that the price of gas should be reduced by 2d. per 1000 cubic feet, and who agreed to take the subject back for reconsideration, on the suggestion being made that the reduction might be greater, came forward on Monday with a recommendation that the reduction should be 3d. per 1000 cubic feet. This was agreed to without comment. The prices now are: For lighting, 2s. 9d.; for power, 2s. 4d.; and for gas used through prepayment meters, 3s. 2d.

In Hawick several years ago the Corporation had all the streets of the town lighted by electricity, which superseded gas. The lighting has not been a success; and its lack of satisfaction was voiced in the Town Council on Tuesday, when Bailie Lawson said "he thought the lighting of the town might be improved. It was not what they expected at all. The electric arc lamps were going out in their faces every night. The sooner they were back to gas the better." The Town Clerk was asked to write to the Electric Lighting Company on the subject.

PRICE OF SULPHATE OF AMMONIA.

From the "Financial Times."

Considerable interest is being taken at present in the market for sulphate of ammonia, which has recently developed marked strength. Since the beginning of the current month, quotations have been advanced by a further 5s. per ton; raising the price to £12 15s. for delivery in the second quarter of 1911. The principal buyer at the moment is America, which is not only purchasing for prompt but also for forward delivery; large lines having been done at between £12 10s. and £12 12s. 6d. per ton for the first quarter of next year. In addition to the naturally strong position of the commodity following upon an increase in the demand, quite a lot of forward selling was indulged in, it appears, when prices were fully £1 per ton below the present level. These forward sales are now being covered; and this, taken in conjunction with the increased demand from the United States, and the fact that two of the leading consuming countries—Spain and Japan—have not yet begun to cover their needs for next season, has brought about a sharp upward movement. The increase in the American demand is due partly at least to the reduction of the tariff by 25 per cent. under the Payne-Aldrich Bill.

Despite a steadily increasing production and the ever-present competition of nitrate of soda, the output of sulphate of ammonia continues to be readily absorbed. Not only so, but the outlook is regarded by the best informed authorities as distinctly promising, both as regards the consumption and values. It was feared at one time that the success of the propaganda work in connection with nitrate of soda would detrimentally affect sulphate of ammonia. But this has not proved to be the case; and every successive increase of production has but apparently extended the area in which the utility of these fertilizers has been proved. . . . Even at the present level of values—which, by the way, shows a very fair margin of profit to producers—it cannot be said that prices are unduly high, as last year's average price was £11 5s. per ton, and the average for the past ten years £11 5s. per ton.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 8.

Sulphate of Ammonia.

In the early part of the week the tone became rather quieter, although there was no decline in values; but during the last two or three days the keen demand has again set in, and the market closes strong at £12 15s. per ton f.o.b. Hull, £12 16s. 3d. per ton f.o.b. Liverpool, and £12 18s. 9d. per ton f.o.b. Leith. The bulk of the requirements have been for the covering of contracts made previously, but consumers both in this country and abroad have shown more disposition to operate at the present level of prices. Several transactions have taken place for delivery in equal monthly quantities October-December, 1910, at full prompt values; and it is reported that the same figures are being paid up to April next year.

Nitrate of Soda.

The position of this article is unaltered, and the quotations are still given as 9s. 4½d. per cwt. for 95 per cent. quality and 9s. 7½d. for refined, on spot.

LONDON, *Oct.* 10.

Tar Products.

The markets for tar products have been fairly steady throughout the past week. Pitch remains about the same, though reports from some quarters are that buyers have been able to purchase at rather lower prices. In some quarters makers are asking slightly improved prices for 90 per cent. benzol; but no orders are reported at the higher

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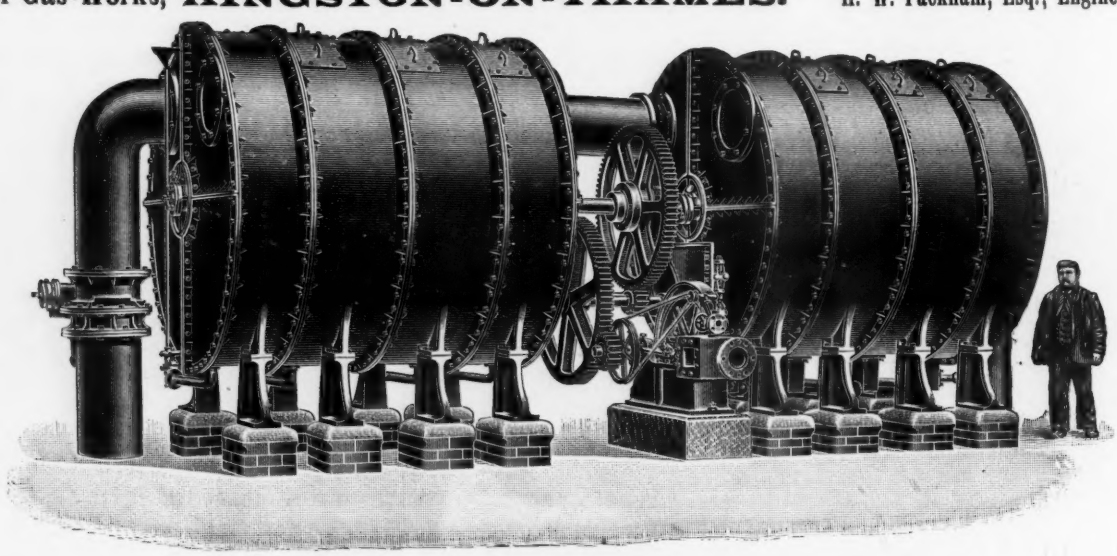

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figures. Reports on the Continent show that the Belgians and Germans are easily able to undersell, and accept lower prices than those which are being quoted on this side. There is very little fresh business in solvent naphtha. Creosote does not show any signs of improvement yet. Crude carbolic acid is still of very little interest.

The average values during the week were: Tar, 18s. 6d. to 22s. 6d. *ex* works. Pitch, London, 36s. 6d. to 37s.; east coast, 36s. to 36s. 6d.; west coast, 38s. to 40s. Clyde ports, 35s. to 36s. Manchester, 36s. to 37s. Liverpool. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 7d. to 7¼d.; 50-90 per cent., casks included, London, 7⅜d. to 7⅝d.; North, 7¼d. to 7½d. Toluol, casks included, London, 9d. to 9¼d.; North, 9d. Crude naphtha, in bulk, London, 3⅜d. to 4d.; North, 3⅜d. to 3¾d.; solvent naphtha, casks included, London, 1s. to 1s. 0⅛d.; North, 11d. to 1s.; heavy naphtha, London, casks included, 11d. to 11½d.; North, 10⅞d. to 11d. Creosote, in bulk, London, 2⅜d. to 2½d.; North, 2d. Heavy oils, in bulk, 2⅜d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market continues very firm; and at the close improved prices were reported as having been paid in some quarters. Actual Beckton is now quoted at £12 8s. 9d.; and for forward they are asking a little more than this. Outside London makes are £12 2s. 6d. to £12 5s. Hull is £12 15s. to £12 16s. 3d.; Liverpool, £12 15s. to £12 16s. 3d.; and in Leith, £12 17s. 6d. is reported to have been paid. In Middlesbrough, the price is £12 15s. to £12 16s. 3d.

From other sources we learn that tar product prices are looking brighter. Benzol is increasing in price; Continental buyers being very prominent. Heavy orders for naphtha have been placed; and the price has improved. Creosote shipments are maintained. Carbolic is a shade better. Tar has responded to the increase in values. The average prices are as follows: Tar, 20s. to 26s. 6d. per ton. Pitch, London for export, 41s. per ton; Manchester, 39s. per ton; Liverpool, 40s. per ton; Glasgow, 40s. On the east coast, during the last few weeks, it is reported that a large order has been placed at 40s. per ton. Creosote sells at 2d. to 2¼d. per gallon, according to position of makers' works; bulk oil 2⅜d. firm. Benzol, 50-90 per cent., fetches 7½d. per gallon, casks included; solvent naphtha, 1s. per gallon naked; crude naphtha, 3¼d. per gallon naked; light oil, 3⅜d. per gallon naked; carbolic acid, 60's, 1s. 0¼d. per gallon; drained salts, 50s. per ton, naked.

The Gas Committee of the Bolton Corporation have approved of a recommendation put forward by the Sanitary Committee that the Town Council should appoint an Analytical Chemist for the purpose of all Corporation analyses. The different Committees have appointed a small Sub-Committee to act jointly in the matter.

COAL TRADE REPORTS.

Northern Coal Trade.

With a fair demand for coals, there is an ample supply, and the prices show a little ease for some kinds. In the steam coal trade, best Northumbrians are from 9s. 6d. to 10s. per ton f.o.b.; second-class steams are 8s. 3d. to 8s. 6d.; and steam smalls are steady at from about 5s. 3d. to 6s. 6d. The output of the collieries is now heavy, and, as the exports to the Baltic are decreasing, there is a little difficulty in finding an outlet for all the steam coals raised. In the gas coal trade, there is that growing demand which usually shows itself at this time of the year. The price of Durham gas coals is, for the usual classes, from 8s. 9d. to 9s. 9d. per ton f.o.b., according to quality; while for special "Wear" sorts, from 10s. 3d. per ton is the current quotation. Among the contracts, those for the Stockholm gas supply have been in treaty for some days; and while the exact prices are not known, it is thought that the bulk of the contract will be placed with Durham collieries at prices not much differing from those at present ruling in the market. Sales forward do not appear to be so numerous as about a month ago; but it is believed that the termination of strikes in several centres may stiffen the market. In coke, there is a steady tone; but gas coals are in heavier supply, and the prices for good gas coke vary from 13s. to 13s. 6d. per ton f.o.b. in the Tyne or Wear.

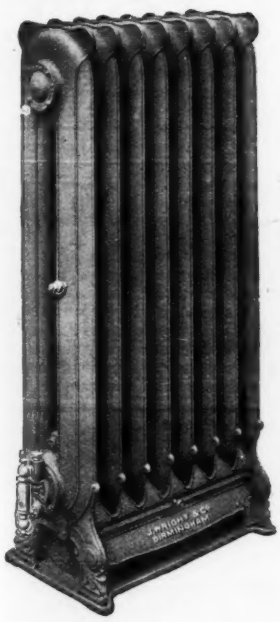
Scotch Coal Trade.

Ell for shipment has been in slightly better request. There is a full supply of splint, and prices have shown a tendency to drop. Small sorts are not in demand. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 344,916 tons—an increase of 12,261 tons upon the previous week, and of 13,923 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,137,572 tons—an increase upon the corresponding period of 720,736 tons.

Newton Ferrers Water Supply.—The Plympton Rural District Council have just had before them plans for a new scheme of water supply for Newton Ferrers, the estimated cost of which is £1928. It was decided that the Council's Engineer should confer with the architect (Mr. Worth) on the scheme, and report to the Newton Ferrers Water Committee thereon.

Suicides by Gas.—At Dewsbury, last Tuesday, Fred Holgate, a musician, was found dead in his bedroom; the loose end of an india-rubber pipe attached to the gas-bracket being in his mouth. On the previous Saturday, Richard Little, of St. Helens, who had suffered from depression, went into his kitchen and, after turning the gas on, knelt upon a chair and placed his face over the gas-stove. When discovered, he was quite dead.

The Pioneer Gas-Steam Radiator



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Inventors of Gas-Stoves.

Under this heading, the following remarks are made in the "Co-Partnership Journal of the South Metropolitan Gas Company" for the current month: The "Strand Magazine" recently alluded to a Mr. Robert Martin, of Liverpool, a gentleman who is in his 87th year, as "the inventor of the gas-stove." We wonder which gas-stove—there are several kinds about. If cooking-stoves are concerned, it may be of interest to mention that as early as 1833—when Mr. Martin was about nine years old—an apparatus for roasting by gas had been patented by a Mr. Hicks, of Wimpo'e Street, W. With this apparatus, 16 cubic feet sufficed to roast 12 lbs. to 14 lbs. of meat. In the "Mirror" of Feb. 16, 1833, there is the following comment on the invention of Mr. Hicks: "The whole business, therefore, of the preparation of human food by the application of heat may be performed by gas, and that with great economy, in all families who roast and bake at home. This is only realizing what was long ago anticipated by the late William Strutt, Esq., of Derby. . . . How far the art of cooking by gas will be suitable for country inns may be considered uncertain in the present infancy of the invention; but as, on calculation, it is found in London to be much cheaper than roasting by open fires of coal, and, for small joints, equally cheap with sending meat to be cooked in a baker's oven, it appears highly probable that, wherever gas is used for lighting, it will answer to employ it also for cooking." We should like to know more about William Strutt, whose anticipations concerning gas cooking date back to a time which was considered "long ago" in 1833.

Penrith Rural Water Scheme.—Last Thursday, Mr. A. W. Brightmore, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry at Greystoke in regard to an application by the Penrith Rural District Council for authority to borrow £23,000 for works of water supply in connection with the western district scheme, which includes several parishes. Mr. J. Graham, of Carlisle, the Engineer of the scheme, furnished details of it; and the Clerk to the Council (Mr. J. W. Smith) explained how the cost would be apportioned between the parishes, from some of which objections had been received. He said the £23,000 should be divided into two sums—viz., £18,069 for common benefit and £4931 for exclusive benefit. The length of common benefit pipes would be 33·3 miles, and exclusive benefit pipes 15·3 miles. The average amount per head for the whole area was £5·6; but taking the parishes separately, there was a considerable difference, ranging from £2·6 to £17·6. There was really one valid appeal only against the apportionment; but the Council were anxious that the whole matter should be thoroughly gone into, because they did not pretend to be experts in the matter, and the Engineer would not pose as an authority. Mr. Graham was examined at some length upon the details of the apportionment. At the close of the inquiry, the Inspector accompanied the Engineer to view the source of the scheme.

The Reported Sale of the Coalite Plant at Hythe.

Referring to the paragraph on this subject which appeared in the last number of the "JOURNAL" (p. 18), the "Chemical Trade Journal" on Saturday made some remarks under the heading of "Current Topics." After expressing the sincere hope that the rumoured sale of the Hythe plant is unfounded, our contemporary said: "If rumour speaks truly, we regret that the coalite process should have met with so ignominious a fate. It is, perhaps, timely for us to state that our constant advocacy of coalite and similar fuels has been actuated solely by a desire to free the atmosphere from smoke. Coalite, in our opinion, promised to do much in the direction of smoke abatement; hence our support of the scheme. We wonder, if the reception accorded to coalite when it was first introduced to the gas industry had been less frigid and distrustful, whether we should have heard the melancholy news of the fate of the Hythe plant? We have become convinced of one thing—*i.e.*, it is extremely hazardous for any inventor to attempt to introduce revolutionary methods into an old-established industry. He is liable to be severely mauled by those who dread the introduction of any change in their ordinary routine. Sometimes he recovers, and finds out eventually that as he grows stronger his former enemies will eventually flock to his side, eager to adopt his suggestions. The news, whether true or not, confirms the opinions recently expressed in the financial press as to the approaching hopeless state of the coalite co-operations. That such a large sum of money as represented by the Coalite Companies' capital should have been subscribed at all showed an amount of confidence in the process by the public and experts that should have spelt success. The difficulties that we foresaw at the commencement of the process, attending the remunerative disposal of the large quantities of rich gas produced, have evidently been too much; and the endeavours to transform the gas into other commodities have brought about the ruin of the Coalite Companies. One thing is certain: Any serious attempt to remove the smoke nuisance without the active and cordial co-operation of the gas interests is doomed to failure. We can only hope that such responsibility on the part of the gas companies will be appreciated at its true value."

The West Hartlepool Town Council have decided to enter into an agreement with the Seaton Carew Iron Company, by which the Corporation will be able to utilize the waste heat from the blast-furnaces at the Seaton Carew Iron-Works for generating electricity. A new power station will be erected near the works at a cost of from £17,000 to £20,000.

In the course of the Inaugural Address of Mr. John Lewis at the meeting of the North of England Gas Managers' Association, as given in the "JOURNAL" last week, he described the method of checking the men's time, which is done by the card system and time recorders, one of which was illustrated. We learn that twelve of these instruments have been supplied to the Newcastle and Gateshead Gas Company by the International Time-Recording Company, of City Road, E.C.

YOUR CONSUMERS WANT HOT WATER

but cannot afford to use a Circulator
burning 10 ft. of Gas per Hour all Day.
But tell them that a

"MAUGHAN" GEYSER

Will give a **Hot Bath for** $\frac{3d.}{4}$
Will give Hot Water for domestic purposes
at $\frac{1d.}{2}$ **per 20 gallons.**
Costs nothing when not actually running.
Will supply **Hot Water at a moment's notice,**
and they will appreciate the more Economical and
Convenient System.

THE PARKINSON STOVE CO., LTD.
(INCORPORATING MAUGHAN'S PATENT GEYSER CO.),
STOUR STREET, SPRING HILL, BIRMINGHAM, and 129, HIGH HOLBORN, LONDON.

Local Government Board and Municipal Loans.

A reply has been received from the Local Government Board by the Secretary of the Manchester Ratepayers' Association to the letter inquiring the source of the legal authority by which the Department dispensed with a local public inquiry in respect of loans amounting to £40,000 for the electricity undertaking of the Manchester Corporation. The communication does not give the information asked for, but states that the question of holding a local inquiry was a matter entirely within the Board's discretion. It is added, however, that the Board have received a further application for sanction to a loan of £30,000 for the provision of a turbo-alternator at the Stuart Street station, and have decided to hold a local inquiry in regard thereto. At the annual meeting of the Ratepayers' Association, the action of the Secretary was approved. Mr. J. C. B. Percy, who supported the motion, referred to the competition existing between the Gas and Electricity Committees. The present position was, he declared, that these Committees were using the ratepayers' money and credit, to bring forces against each other which would practically annihilate both; and the ratepayers would have to "pay the piper."

Remuneration for Extra Services.—At the meeting of the Teignmouth Urban District Council last Tuesday, some discussion took place upon a recommendation of the Gas Committee that the extra services rendered by Mr. J. A. Gray, the Gas Engineer and Manager, in connection with the new purifiers, were deserving of consideration. Mr. Bird proposed that the salary of Mr. Gray should be raised next quarter by £25. Mr. Wheatley, in seconding the motion, pointed out that the Council's suggestion had been satisfactorily carried out by the Gas Manager. Objections having been raised to the proposition, the Chairman said if any man deserved an *honorarium* it was Mr. Gray, who had handled the gas-works in a creditable manner. He (the Chairman) had, however, never voted for an *honorarium* to an official, and did not intend to do so now. He maintained that if the salaries of their officials were not sufficient, they should be raised. Mr. Bird reminded the Council that when the purifiers were being put up, the question arose as to whether the Gas Manager should do the work or have outside help. If the Council had had to engage the services of an outside engineer, they would have had to pay him a great deal more than they were now being asked to give the Gas Manager. The motion was carried by four votes to three.

Messrs. R. & A. Main, Limited, have appointed Mr. J. W. Defries as an additional representative of the Company for the London district.

The Directors of the Primitiva Gas Company of Buenos Ayres have announced an interim dividend of 3s. per share on the ordinary shares, free of tax, for the half year ended the 30th of June.

Under the title of "Prepared Cokes," a company has been formed with a capital of £4000, in £1 shares, to take over the business of a breeze coke manufacturer carried on by Mr. R. E. Vickerman at Castleford.

With the view of still further extending their gas consumption for domestic purposes, the Newport (Salop) Gas Company have arranged to supply free of cost to their consumers complete "slot" installations, including cooking and lighting fixtures. This work has been placed entirely in the hands of Messrs. John Wright and Co.

By 33 votes to 7, the Rochdale Town Council on Thursday last confirmed a recommendation of the Water Committee that the contract for the construction of a new service reservoir at Buersil be let to Mr. Hyslop, of Oswaldtwistle, near Accrington, whose price was £13,400. On two previous occasions, tenders have been accepted and subsequently withdrawn.

Our attention has been called to a rather curious juxtaposition of announcements in the opening pages of the catalogue of a large drapery firm in South London. On the left-hand page it is stated that the premises are "lighted throughout with electric light," and on the opposite one that they are "protected against fire by sprinklers." In view of the recent serious conflagrations in drapery establishments in the portion of the Metropolis lying south of the Thames, the two announcements have a peculiar significance.

At last Wednesday's meeting of the Manchester City Council, Mr. Jennison (who has frequently advocated, but without success, in the Council Chamber that consumers of gas by prepayment meter should only be charged at the same rate as ordinary meter users) asked Alderman Gibson, the Chairman of the Gas Committee, whether "science" had not caused a reduction in the price of automatic meters. "I do not know what science has done," replied Alderman Gibson, "but diplomacy has enabled us to get them several shillings cheaper."

Fred Marshall, a mechanic, of Windhill, died some days ago from injuries caused by an explosion which occurred while he was at work altering an acetylene plant. From the evidence given at the inquest, it seemed that the deceased had a light close to the apparatus, which had quite recently been in use. The District Coroner (Mr. E. H. Hill) remarked that the circumstances of the case showed how dangerous it was for men to meddle with things which they did not properly understand. He thought it was not sufficiently known how dangerously explosive was this kind of gas.

We have received from the Centenary Gas Company, of Glasgow and London, a pamphlet containing illustrated descriptions of their petrol-air gas turbine generator and of the various lighting and other appliances with which the gas can be used. It is claimed that the mixture of air and petrol vapour produced by the Company's plant is non-explosive, burns with a soft and brilliant light, and is low in cost; a light of 1000-candle power being produced at the cost of 1d. per hour. Readers of the "JOURNAL" are probably aware that Mr. William Key, formerly Superintendent of the Tradeston Gas-Works, Glasgow, is associated with the Company; and their turbine generator is the outcome of his long practical experience as a gas engineer.

MODERN HEATING

"CANNON"

GAS HEATED STEAM

RADIATORS.

The "EQUATOR."

On Hire with

LEADING GAS COMPANIES.

LARGE DEMAND.
EVERY SATISFACTION.
HIGHEST TESTIMONIALS.

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Australasian Agents:—

JAMES HURLL & CO., Ltd., 20, Loftus St., SYDNEY.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Stafford Gas and Electricity Department. Applications by Oct. 24.
HEAD FITTER. Pembroke Docks and Town Gas Company.
STOKER. No. 5299.

Plant, &c. (Second Hand), for Sale.

GAS-WORKS (DISPOSAL OR LEASE), Beaumaris. Particulars of Mr. Cripwell, Birmingham.
GAS-WORKS (South of England). No. 5296.

Plant (Second Hand) Wanted.

EXHAUSTER. No. 5297.
PURIFIER. No. 5298.
RETORT MOUTHPIECES AND RETORT-HOUSE GOVERNOR. No. 5293.

Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. Nov. 1. 2.30 o'clock.

Stocks and Shares.

BOGNOR GASLIGHT COMPANY (BY AUCTION). Oct. 25.
DORKING WATER COMPANY (BY AUCTION). Oct. 18.
GRAYS AND TILBURY GAS COMPANY (BY AUCTION). Oct. 25.
HORNSEY GAS COMPANY (BY AUCTION). Oct. 18.
NORTH MIDDLESEX GAS COMPANY (BY AUCTION). Oct. 18.
REDHILL GAS COMPANY (BY TENDER). Nov. 1.
SOUTHEND WATER COMPANY (BY AUCTION). Oct. 18.
SOUTH STAFFORDSHIRE WATER COMPANY (BY TENDER).
TENDRING HUNDRED WATER COMPANY (BY AUCTION). Oct. 25.

TENDERS FOR

Benzol (Crude).

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by Oct. 24.

Fire-Clay Goods, &c.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by Oct. 29.

Oxide of Iron (New and Spent).

DARWEN GAS DEPARTMENT. Tenders by Oct. 21.

Retort Ironwork, &c.

DEVONPORT GAS DEPARTMENT. Tenders by Nov. 5.

Tar-Towers, &c.

BARNSLEY GAS COMPANY. Tenders by Oct. 11.

Washers.

DEVONPORT GAS DEPARTMENT. Tenders by Nov. 5.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 94.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,863	Stk.	Apl 1	5	Alliance & Dublin Ord.	88-90	+1	5 11 1
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	95-98	..	4 1 8
200,000	5	May 12	7	Bombay, Ltd.	6⅞-6⅝	..	5 5 8
40,000	5		7	Do. New, £4 paid	5-5¼	..	5 6 8
50,000	10	Aug. 31	15	Bournemouth Gas & Water	28½-29½	..	5 1 8
					16-16½	..	4 4 10
311,810	10	,,	7		14⅜-15⅛	..	3 18 8
75,000	10	,,	6				
980,000	Stk.	Aug. 12	12½	Brentford Consolidated	246-249	..	5 0 5
330,000	,,		9½	Do. New	184-186	..	5 2 2
50,000	,,	,,	5	Do. 5 p.c. Pref.	—	..	—
206,250	,,	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	215-218	..	5 0 11
246,320	,,	,,	8	Do. A Ord. Stk.	155-158	..	5 1 3
460,000	20	Sept. 29	10⅝	British	44-45*	..	4 12 4
109,000	Stk.	Aug 11	6	Bromley, A 5 p.c.	117-119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c.	88-90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	106-108	..	5 1 10
55,000	,,	June 29	3½	Do. 3½ p.c. Deb.	85-87	..	4 0 6
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	—	—	Cape Town & Dis., Ltd.	3-4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅜-6⅛	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	50½-51½	..	5 16 6
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	109½-111⅛	..	4 9 8
1,513,280	Stk.	,,	5 9/16	Commercial 4 p.c. Stk.	105-108	..	4 16 3
560,000	,,	,,	5	Do. 3½ p.c. do.	101-103	..	4 17 1
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	79-81	..	3 14 1
800 000	Stk.	June 10	5	Continental Union, Ltd.	97-99	..	5 1 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137-139	..	5 0 9
492,270	Stk.	—	5½	Derby Con. Stk.	122-124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104-105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	105-107	+9	4 13 6
486,092	10	July 14	12	European, Ltd.	23⅞-24¼	+¼	4 19 0
354,060	10	,,	12	Do. £7 10s. paid.	17⅞-18⅛	..	4 18 8
16,179,445	Stk.	Aug. 12	4⅝	Gas light and Coke	4 p.c. Ord.	106-107	..	4 7 2
2,600,000	,,	,,	3⅛		3½ p.c. max.	87-89	..	3 18 8
4,002,235	,,	,,	4		4 p.c. Con. Pref.	104-106	+1	3 15 6
4,531,705	,,	June 29	3		3 p.c. Con. Deb.	80-82	..	3 13 2
258,740	Stk.	Sept 15	5	Hastings & St. L. 3½ p.c.		92-94	..	5 6 5
82,500	,,	,,	6½	Do. do. 5 p.c.		114-116	..	5 12 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.		17½-17⅝	+½	6 4 0
131,010	Stk.	Sept. 15	7⅛	Ilford A and C		145-148	..	4 19 8
65,780	,,	,,	5⅝	Do. B		112-114	..	5 3 1
65,500	,,	June 29	4	Do. 4 p.c. Deb.		98-100	..	4 0 0
4,940,000	Stk.	May 12	9†	Imperial Continental		187-189	..	4 15 3
1,235,000	Stk.	Aug 12	3½	Do. 3½ p.c. Deb. Red.		94-96	+1	3 12 11
200,242	Stk.	Aug 31	6	Lea Bridge Ord. 5 p.c.		120-123	..	4 13 4
561,000	Stk.	,,	10	Liverpool United A.		220-222	+1	4 10 1
718,100	,,	,,	7	Do. B		162-164	..	4 5 4
306,083	,,	June 29	4	Do. Deb. Stk.		104-106	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean.		4⅜-4⅝	..	6 4 8
560,000	100	Oct 1	5	Met. of 5 p.c. Deb.		59-101*	..	4 19 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.		99-101*	..	4 9 1
541,920	20	May 27	3½	Monte Video, Ltd.		12½-13	..	5 7 8
1,775,892	Stk.	July 28	4⅛	Newc'tle & G'tesh'd Con.		101½-102½	−½	4 5 4
529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.		90-91	..	3 16 11
55,940	10	Aug. 31	7	North Middlesex 7 p.c.		13⅜-14⅜	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.		138-140	..	5 14 4
60,000	5	Sept 15	8	Ottoman, Ltd.		6-6¼	..	6 8 0
31,800	53	Aug. 31	13	Portsea Island A.		131-133	..	5 3 0
60,000	50	,,	13	Do. B.		124-126	..	5 3 2
100,000	50	,,	12	Do. C.		117-119	..	5 0 10
114,800	50	,,	10	Do. D and E.		99-101	..	4 19 0
398,490	5	Apl. 29	7	Primitiva Ord.		7⅛-7⅜	..	4 13 4
796,980	5	June 29	5	Do. 5 p.c. Pref.		58-58	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.		97-99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.		97-99	..	4 0 10
250,000	10	Sept 29	9	San Paulo, Ltd.		15⅛-15⅜*	..	5 14 3
62,500	10	,,	6	Do. 6 p.c. Pref.		11⅛-11⅜*	..	5 2 2
125,000	50	July 1	5	Do. 5 p.c. Deb.		51-52	..	4 16 2
135,000	Stk.	Aug. 31	10	Sheffield A		229-231	..	4 6 7
209,984	,,	,,	10	Do. B		229-231	..	4 6 7
523,500	,,	,,	10	Do. C		229-231	..	4 6 7
70,000	10	May 27	7	South African		11-11⅛	..	6 1 9
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.		121-123	..	4 8 10
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.		80-82	..	3 13 2
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.		155-157	..	5 1 11
605,000	Stk.	Aug. 12	5⅝	S'th Suburb'n Ord. 5 p.c.		120-122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.		120-122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.		121-123	..	4 1 4
502,310	Stk.	May 12	5	Southampton Ord.		110-112	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham A 5 p.c.		141-143	..	4 17 11
483,940	,,	,,	5½	and B 3½ p.c.		112-114	..	4 16 6
149,470	,,	June 29	4	Edmonton 4 p.c. Deb.		57-59	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.		9-9⅜	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		98-100	+1	5 0 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.		112-114	+½	4 7 9
255,636	Stk.	Aug. 31	6½	Wands- B 3½ p.c.		139-141	..	4 15 9
85,766	,,	June 29	3	worth 3 p.c. Deb. Stk.		73-75	..	4 0 0

Prices marked * are "Ex div." † Next dividend will be at this rate.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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CHARLES E. FRY, SUTTON, SURREY.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, Oct. 4, p. IV. of Centre.
ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

FOR Immediate Disposal.
Manufactured specially for giving Satisfaction
Any required number of
COKEBREAKERS.
Hand or Power Driven.
Apply, JAMES MILNE AND SON, LIMITED.
EDINBURGH, LONDON, GLASGOW, LEEDS.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2886 HOLBORN.

SUCCESS by Saltation for most is improbable; the law of averages indicates system, backed by expert advice, as giving the surest results. Discard spasmodic, amateur efforts, and write now HERBERT GREATOREX, Application Specialist, Beechwood, MATLOCK.

The Chairman said—"The Company were fighting the keen Electric competition with great success."

THAT Company used advice given by—
J. P. VINALL,
ADVERTISING MAN,
183, HAVERSTOCK HILL, LONDON, N.W.
'Phone—3842 P.O. HAMPSTEAD.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

"HALLITE" Asbestos High-Pressure Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Aug. 23, p. 548.

M.H. (Methane Hydrogen) **GAS PLANT, LTD.,**
19, GREAT WINCHESTER STREET, LONDON, E.C.
The M.H. GAS PLANT produces at will:—
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.
BLUE WATER GAS from Coke and Steam.
CARBURETTED WATER GAS from Coke, Steam, and any Crude Oil.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

READ HOLLIDAY AND SONS, LTD.
HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.
ENQUIRIES SOLICITED.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 28, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

FOR SALE.
SYPHON PUMPS
of the very latest improved design.
Apply early
JAMES MILNE AND SON, LIMITED.
EDINBURGH, LONDON, GLASGOW, LEEDS.
OUR DUTY—YOUR PLEASURE.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

IT is Worth Your While to Buy Direct from the RELIANCE LUBRICATING OIL COMPANY GUARANTEED ANTI-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 1s. 6d.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 1s. 9d.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20, Water Lane, Tower St., LONDON, E.C. Agents wanted.

WARNER & VAN DER BIESEN,
ZWOLLE, HOLLAND.
DIGGERS AND SUPPLIERS OF THE
FINEST DUTCH BOG-ORE.
(Natural Oxide of Iron.)
Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

COAL TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

CITY and Guilds—Courses in Gas Engineering and Supply (over 100 Passes and 6 Medals in Two Years), Structural Engineering and Heating and Ventilating (two new subjects) for the 1911 Examinations.
CORRESPONDENCE COLLEGE COMPANY, Dept. W. 26, Green Street, CAMBRIDGE.

TAR WANTED.
THE BURNDEN TAR COMPANY (BOLTON), LIMITED.
Hulton Chemical Works, BOLTON.

PEMBROKE DOCKS AND TOWN GAS COMPANY.
WANTED, a HEAD FITTER for the Company's District.
Applications, stating Age, Wages, and Qualifications, to W. B. MIMMACK, Manager, Gas-Works, PEMBROKE Dock.

WANTED, a Good Stoker, used to Shovel Charging, Regenerative Settings, Engine and Exhauster, and General Routine of a Gas-Works. Permanency for a suitable Man. None but Steady and Reliable Men need apply.
Apply, by letter, stating Age and Experience, with *Copies* of Testimonials, to No. 5299, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF STAFFORD.
(GAS AND ELECTRICITY DEPARTMENT.)
THE Corporation of Stafford invite APPLICATIONS for the Appointment of ENGINEER and MANAGER to take Entire Charge of the Gas Department and Supervise the Electricity Department.
Applicants must possess a thorough knowledge of Gas Engineering, and be capable of Designing, Superintending, and Carrying Out any Extensions or Alterations that may be required at the Gas-Works, and undertake the General Supervision of the Electricity Department.
Salary to commence at £350 per Annum, rising (subject to satisfactory services) by annual increments of £25 to £500 per Annum.
Candidate's age to be between 28 and 45.
Applications, stating Age, Training, and Experience (with *Copies* of not more than Three recent Testimonials), to be sent to me on or before Monday, the 24th of October instant.
Canvassing in any way whatever will be a disqualification.
RICHD. BATTLE,
Town Clerk.
Borough Hall, Stafford,
Oct. 4, 1910.

WANTED—A Second-Hand Exhauster, to Pass 50,000 Cubic Feet of Gas per Hour.
Send Price and Particulars to No. 5297, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED—A Second-Hand Purifier, in good Condition, for 150,000 Cubic Feet per Day.
Address No. 5298, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—As a Going Concern, a small GAS-WORKS and PLANT in the South of England. Annual make about One Million Cubic Feet.
For Particulars Apply to No. 5296, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

***RE* THE BEAUMARIS GAS-WORKS, BEAUMARIS.**
THE Trustee of the above Estate will be pleased to receive OFFERS for the above BUSINESS, together with the PURCHASE OF PLANT, &c.
The Works and fixed Plant may be had upon Lease. Full Description and Particulars, including turn-over, &c., on Application to Mr. ALBERT CRIPWELL, Accountant and Auditor, 12, Cherry Street, BIRMINGHAM.

FOR SALE—Complete Gas-Making PLANT, including New Gasholder and Steel Tank, 10,000 Cubic Feet capacity, ready for delivery, with Condensers, Scrubber, Purifiers, &c. Erected complete in England for £1200. Detailed Plan and Specification submitted.
TWO PURIFIERS, 12 ft. by 8 ft. by 5 ft. deep. Three Purifiers 5 ft. 6 in. square, complete with Four-Way Valves and Connections. Re-Erected cheap for immediate Sale.
GASHOLDERS, 16 ft., 24 ft., 26 ft., 30 ft., 42 ft., and 45 ft. diameter. Also 70,000 and 200,000 Cubic Feet capacity Gasholders. Cheap for immediate Sale. Re-Erected in either brick or new Steel Tanks. Full Particulars and Quotation submitted.
STORAGE TANK, 18 ft. long, 13 ft. 6 in. wide, 6 ft. deep, of ⅜-inch thick Boiler Plate. Also CAST-IRON TANKS. Inquiries Solicited.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

THE Llandudno Urban District Council invite TENDERS for the Supply of RETORTS, FIRE CLAY GOODS, &c., delivered free at Llandudno.
Full Particulars may be obtained upon Application to the Gas Manager.
Sealed Tenders, endorsed "Retorts," to be sent in to the undersigned on or before Saturday, the 29th of October, 1910.
The Council do not bind themselves to accept the lowest or any Tender.
(Signed) ALFRED CONOLLY,
Clerk to the Council.
Town Hall, Llandudno,
Oct. 6, 1910.

COUNTY BOROUGH OF DEVONPORT.
(GAS DEPARTMENT.)
TENDERS are invited for the carrying out of the following work:—
1—The Supply and Erection of new IRON WORK for Twelve Benches of Through RETORTS.
2—The Supply and Erection of Two ROTARY WASHERS and One LIVESEY WASHER.
Full Particulars may be obtained from the undersigned.
Tenders, endorsed "Tender No. 1" or "No. 2," to be sent, addressed to the Town Clerk, Devonport, on or before the 5th of November, 1910.
W. P. TERVET,
Engineer and Manager.
Gas-Works, Devonport,
Oct. 3, 1910.

BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLESMERE.)
TENDERS are invited for a quantity of from 8000 to 12,000 Gallons per month of CRUDE BENZOL, testing 80 per cent. at 120° C., during the next Six Months, delivered into Contractor's Tanks at the Bridgewater Collieries Wharton Hall Siding (Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway) or at the Brackley Siding (Little Hulton Mineral Branch of the London and North Western Railway).
Tenders, endorsed "Tender for Crude Benzol," to be received at The BRIDGEWATER COAL OFFICES, 4, Chapel Walks, MANCHESTER, not later than the 24th inst.
Manchester, Oct. 11, 1910.

BOROUGH OF DARWEN.
SPENT OXIDE.
THE Gas Committee of the above Cor- poration invite TENDERS for the Purchase of about 350 to 400 Tons of SPENT OXIDE.
All Particulars and Samples may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Spent Oxide," to be delivered to the undersigned not later than Saturday, the 22nd day of October, 1910.
No Tender necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office, Darwen,
Oct. 7, 1910.

BOROUGH OF DARWEN.
TENDERS FOR THE SUPPLY OF OXIDE OF IRON.
THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Supply of 250 Tons of OXIDE of IRON, delivered at their Siding, for Gas Purification purposes at their Works.
All Particulars may be obtained from Mr. A. H. Smith, Gas Engineer, Darwen, to whom all Samples are to be sent.
Sealed Tenders, endorsed "Oxide of Iron," to be delivered to the undersigned not later than Saturday, the 22nd day of October, 1910.
The lowest or any Tender not necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office, Darwen,
Oct. 7, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.
MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.
NEW ISSUE OF 1000 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of Chas. King, Esq., decd., and other Owners.
DORKING WATER COMPANY.
80 £10 FIVE PER CENT. "B" PREFERENCE SHARES.
NORTH MIDDLESEX GAS COMPANY.
10 £10 ORIGINAL ORDINARY SHARES AND 60 £10 ADDITIONAL ORDINARY SHARES.
HORNSEY GAS COMPANY.
£200 "A" STOCK AND £400 FIVE PER CENT. PREFERENCE STOCK.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
TENDRING HUNDRED WATER-WORKS COMPANY.
(Supplying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)
NEW ISSUE OF 351 £10 "B" SHARES.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.
NEW ISSUE OF 400 £10 "B" SHARES.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BOGNOR GASLIGHT AND COKE COMPANY.
NEW ISSUE OF £4000 ADDITIONAL ORDINARY CONSOLIDATED STOCK "A"
AND
£2000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK.
MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THE REDHILL GAS COMPANY.
SALE OF ORDINARY "B" STOCK.
NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER £5000 of ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Tuesday, the 1st of November, 1910, at Twelve o'clock at Noon.
Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Brighton Road, Redhill.
By order of the Directors,
HORACE LONG,
Secretary.
Redhill, Surrey,
Sept. 30, 1910.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.
SALE BY TENDER
OF
£7000 NEW ORDINARY STOCK, CLASS "B,"
AND
£13,800 NEW FIVE PER CENT. PREFERENCE STOCK, CLASS "F," IN LOTS OF £100 EACH.
(Under the Provisions of the South Staffordshire Water-Works Order, 1901.)
Trustees are empowered by Act of Parliament to invest Trust Funds in this Preference Stock.
THE Directors Hereby Give Notice, that, in accordance with the provisions of the South Staffordshire Water-Works Order, 1901, they offer for Subscription, by TENDER, the above-mentioned amount of NEW ORDINARY and NEW PREFERENCE STOCK, in lots of £100 each.
The New Ordinary Stock will rank for Dividend with the existing Ordinary Stock of the Company on which Dividends are limited to £7 per centum per Annum.
The Holders of the New Ordinary Stock will have the same privileges as to Voting and Qualification as the Holders of the existing Ordinary Stock.
The Holders of the New Preference Stock will be entitled to Dividend, payable half-yearly, at the rate of, but not exceeding, £5 per centum per Annum out of the profits of the undertaking in each Year.
Tenders may be made for any number of lots of £100 each for either or both classes of Stock. The latest date for receipt of Tenders is fixed for Thursday, the 10th day of November, 1910.
Notices of Allotment will be sent out by the Company on or before Tuesday, the 15th day of November, 1910; and the date for payment of the whole amount of the Stock and Premiums to the Company's Bankers is fixed for Wednesday, the 30th day of November, 1910, after which day the Stock will rank for Dividend.
The Allotment will be made and Certificates will subsequently be issued free of all costs to the Allottees, who will thus acquire the Stock without payment for Stamps, Commission, or Fees of any kind.
Forms of Tender and any further Information may be obtained upon Application at the Company's Office.
By order,
G. J. SPARROW,
Secretary.
Paradise Street,
Birmingham, Oct. 10, 1910.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 1st day of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors; a Dividend declared for the Half Year ended the 30th of June, 1910; and the usual Ordinary Business of such Meeting transacted.

NOTICE IS HEREBY ALSO GIVEN, that the REGISTER OF TRANSFERS OF CAPITAL STOCK WILL BE CLOSED from the 18th inst. to the 1st prox., both days inclusive.

By order of the Board,
ROBT. W. WILSON,
Secretary.

Offices: 21, Austin Friars,
London, E.C., Oct. 10, 1910.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

KOPPERS' PATENT
CHAMBER OVENS.

Results obtained which have never been Surpassed by any other System of Carbonization.
Plants at Work and under Construction for the production of **18,000,000** cubic feet of Gas per Day.
See our large Advertisement appearing in alternate issues of the "JOURNAL."

The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

THE
"PARKINSON"
INVERTED BURNER

LANTERN.

No. PARKINSON and W. & B. COWAN, Ltd. 840.
LONDON, EDINBURGH, BIRMINGHAM, MANCHESTER, BELFAST, SYDNEY, N.S.W.

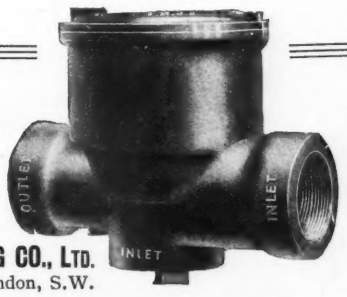
An Increased Revenue

is secured to Gas Cos. when consumers use the FOSTER GAS GOVERNOR, owing to the fact that when a "FOSTER" is installed cooking by gas becomes more economical than by any other method, besides being cleaner and quicker—hence a bigger day-load. As much as 40% is saved on the Gas Bill when a FOSTER (patent) GAS GOVERNOR is used.

A great improvement is effected in gas lighting by this little device. It is easily fixed and quite safe. Every Engineer and Retailer should at once investigate the "FOSTER." We give big discounts and render all help to promote sales. Approved by the leading Gas Cos.

WRITE FOR LIST TO-DAY.

It interests Gas Managers and retailers alike.



FOSTER ENGINEERING CO., LTD.
Works: Wimbledon, London, S.W.

THE LADDITE MANTLE

"the Star of the Mantle World," still **holds the field** for Strength and Light, as users have proved for themselves. The Company have recently quadrupled their powers of production to meet the great demand. **Facts speak for themselves.**

The Company are now prepared to negotiate large contracts, and guarantee prompt deliveries.

AWARDED GOLD MEDAL, FRANCO-BRITISH EXHIBITION.

General Offices and Works:
THE LADDITE INCANDESCENT MANTLE CO., LTD., PENRHYN ROAD, KINGSTON-ON-THAMES.

Telegrams: "Airproof, London."

THOMAS BUGDEN & CO.,

Telephone: 743 City.

India-Rubber and Airproof Manufacturers and General Contractors,
116-118, GOSWELL ROAD, LONDON, E.C.
Largest Manufacturers of Gas Main Bags.

Sewer and Fireman's Boots.

Gas Bags for repairing Mains. All Seams Stitched and Taped.

Patentees of the DENMAR BAG,
Impervious to Main Liquor and Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.

Gas Bags for repairing Mains. All Seams Stitched and Taped.

Contractors' and Miners' Jackets.

BIRTLEY IRON COMPANY,

ESTABLISHED 1890,

Owners of the Birtley Iron Works and Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER,

Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

COOKE, ENNEVER & TULK,

Stock Brokers,

17 & 18, NEWGATE STREET, E.C., and PRINCE'S CHAMBERS, BIRMINGHAM.

We are Buyers and Sellers by Private Treaty of Stocks, Shares, and Debentures in approved Old Established Water or Gas Undertakings, and make this a speciality. Prices quoted on Application.

New Capital issued, Municipal Loans arranged.

COOKE, ENNEVER & TULK,

'Phone City 4660. Tele.: "BIPUNCTUAL LONDON."

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

NEWTONGRANGE, MIDLOTHIAN.

MIDLAND ENAMELLING CO.,

Manufacturers of

DIALS (Enamelled)

For Gas, Water, Electric, &c., Meters.

DIALS

For Pressure Scales in One Length up to 4 feet.

DIALS

For Clocks, Barometers, Thermometer Indicators, and for every purpose.

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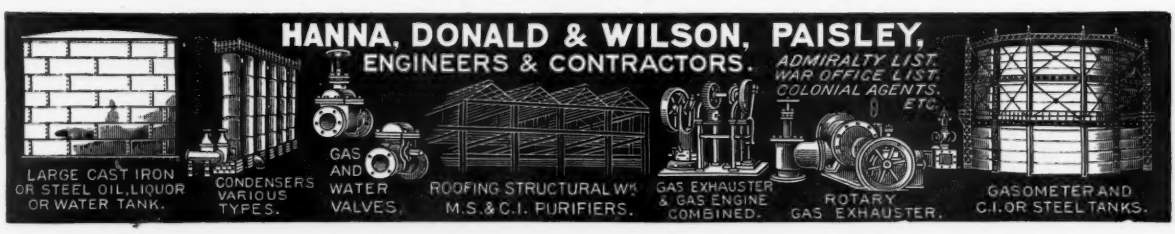
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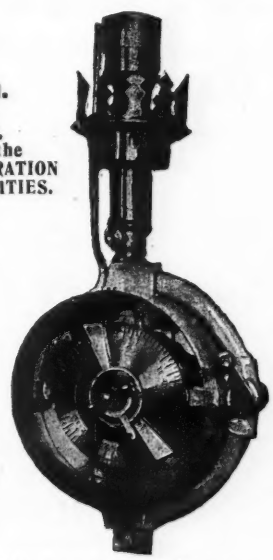

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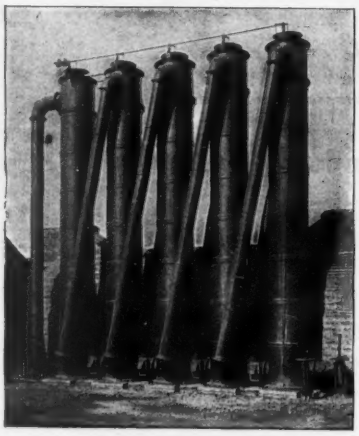

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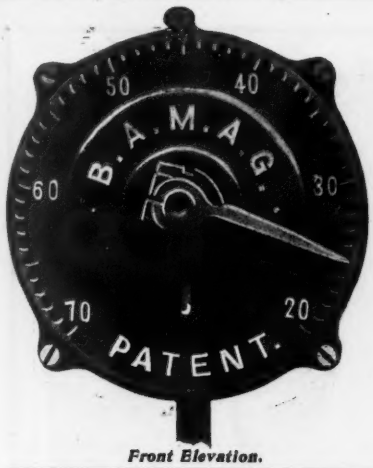

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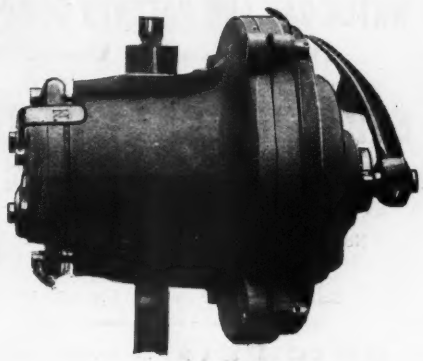
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Purifier changes are less by over one-half when using "LUX" as compared with Bog Ore, and it requires considerably less turning than Bog Ore for revivification.

As a labour saver, this speaks for itself, but in addition there is lessened risk, worry, and anxiety for the management.

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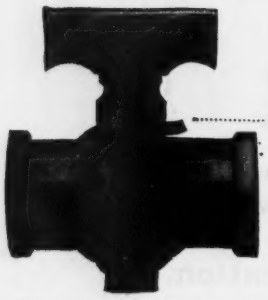

Fig. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

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"SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

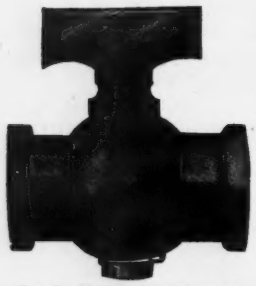

Fig. 2. **Evered's Patent "Safety Stop."** No Pin, No trouble.

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renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

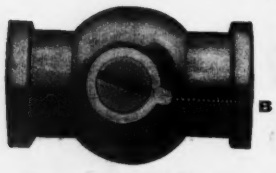

Fig. 3. Underside showing "Safety Stop" in lieu of Pin.

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Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, **4½d.** each, or **4s. 3d.** per dozen, subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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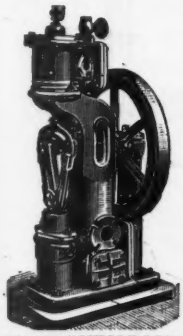

Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

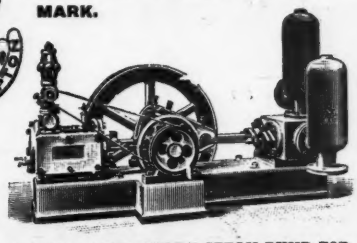

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

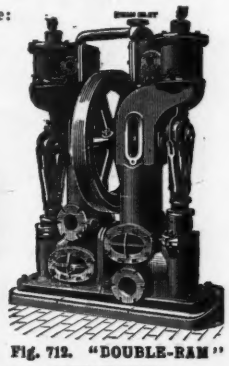

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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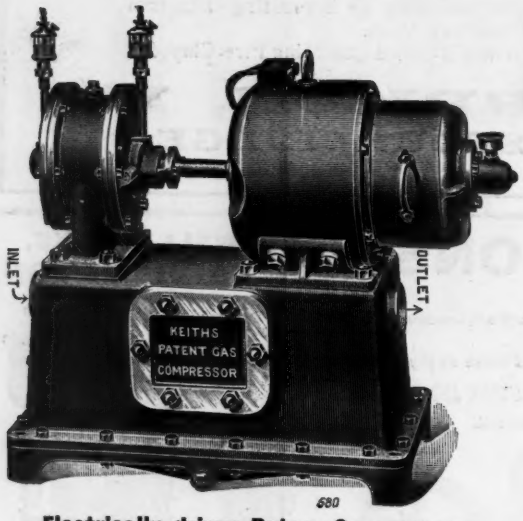

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